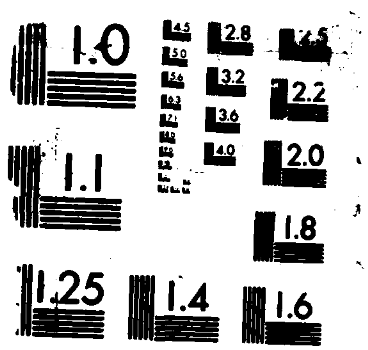
AD-A188 415 USER'S MANUAL FOR GENERATING SUPERSONIC DATA BASES FOR MILITARY OPERATION (U) SPECTRUM SCIENCES AND SOFTWARE INC FORT WALTON BEACH FL R E LEBLANC 15 OCT 86 1/1

UNCLASSIFIED SSS-ER-86-06 AAMRL-TR-87-031 F/G 12/5 NL



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AD-A188 415

USER'S MANUAL FOR GENERATING SUPERSONIC DATA BASES FOR MILITARY OPERATIONS AREAS

ROBERT E. LeBLANC

SPECTRUM SCIENCES & SOFTWARE, INC.
2004-B LEWIS TURNER BLVD.
FORT WALTON BEACH, FL 32548

OCTOBER 1986

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NOISE AND SONIC BOOM IMPACT TECHNOLOGY (NSBIT) ADPO
HUMAN SYSTEMS DIVISION
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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) SSS-ER-86-06	5. MONITORING ORGANIZATION REPORT NUMBER(S) AAMRL-TR-87-031
6a. NAME OF PERFORMING ORGANIZATION Spectrum Sciences and Software Inc. 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION Noise & Sonic Boom Impact Technology (NSBIT) Program, Human Systemes Division
6c. ADDRESS (City, State and ZIP Code) 2004 - B Lewis Blvd Fort Walton Beach, Florida 32548	7b. ADDRESS (City, State and ZIP Code) Brooks AFB TX 78235
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Directorate of Environmental Planning 8b. OFFICE SYMBOL (If applicable) DEV	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER Control No. F08637-84-D0002 5010
8c. ADDRESS (City, State and ZIP Code) Air Force Engineering and Services Center Tyndall Air Force Base, Florida 32403	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO. 63723F; PROJECT NO. 3037; TASK NO.; WORK UNIT NO.

11. TITLE (Include Security Classification)
User Manual for Generating Supersonic Data Bases for Military Operations Areas

12. PERSONAL AUTHOR(S)
Robert E Leblanc

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Yr., Mo., Day)	15. PAGE COUNT
Final	FROM 1/15/86 TO 10/15/86	86 Oct 15	88

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD	GROUP	SUB. GR.
20	01	

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
Supersonic ACMI Data Bases
Military Operating Areas

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This report documents the development of supersonic data bases for five military operations areas (MOAs) and presents a user's guide to the two programs that were used to develop the data bases. Data bases were developed for Holloman, Luke, Oceana, Tyndall and Nellis MOAs. These data bases were generated on the Tyndall AFB Cyber Computer using two computer programs (MOAOPS and BOOM-MAP) developed by BBN Laboratories that extract and analyze data from the Tactical Air Crew Training Systems/Air Combat Maneuvering Instrumentation (TACTS/ACMI) manufactured by Cubic Corporation. The TACTS/ACMI system digitizes various positional and performance parameters of the aircraft on the range at frequent intervals for later replay in graphic or tabular form during aircrew debriefings.

The MOAOPS program extracts information from TACTS/ACMI mission standard data tapes and compiles a library of engineering data concerning the supersonic operations. The

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Lt Col GERAL LONG	22b. TELEPHONE NUMBER (Include Area Code) (513) 255-8416 22c. OFFICE SYMBOL AAMRL/CC(NSBIT)

DD FORM 1473, 83 APR — EDITION OF 1 JAN 73 IS OBSOLETE.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

BOOM-MAP program calculates various statistics on the supersonic operations. It also calculates expected sonic boom levels on the ground based on the extracted information.

The results of the work performed on this contract verify the production capability of the MOAOPS and BOOM-MAP programs for extracting and analyzing data from TACTS/ACMI data tapes. Output from the BOOM-MAP program in terms of supersonic and boom producing flight track maps and noise contour maps, provide the environmental and range planner with important and useful tools to analyze MOA operations.

ABSTRACT

This report documents the development of supersonic data bases for five military operations areas (MOAs) and presents a user's guide to the two programs that were used to develop the data bases. Data bases were developed for Holloman, Luke, Oceana, Tyndall and Nellis MOAs. These data bases were generated on the Tyndall AFB Cyber Computer using two computer programs (MOAOPS and BOOM-MAP) developed by BBN Laboratories that extract and analyze data from the Tactical Air Crew Training Systems/Air Combat Maneuvering Instrumentation (TACTS/ACMI) manufactured by Cubic Corporation. The TACTS/ACMI system digitizes various positional and performance parameters of the aircraft on the range at frequent intervals for later replay in graphic or tabular form during aircrew debriefings.

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SUMMARY

This report documents the development of supersonic data bases for five military operations areas (MOAs) and presents a user's guide to the two programs that were used to develop the data bases. Data bases were developed for Holloman, Luke, Oceana, Tyndall and Nellis MOAs. These data bases were generated on the Tyndall AFB Cyber Computer using two computer programs (MOAOPS and BOOM-MAP) developed by BBN Laboratories that extract and analyze data from the Tactical Air Crew Training Systems/Air Combat Maneuvering Instrumentation (TACTS/ACMI) manufactured by Cubic Corporation. The TACTS/ACMI system digitizes various positional and performance parameters of the aircraft on the range at frequent intervals for later replay in graphic or tabular form during aircrew debriefings.

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The MOAOPS program was originally written to read data directly from TACTS/ACMI mission tapes; however, this was not possible on the Tyndall computer. Data on the mission tape was first copied to a disk file before executing the MOAOPS program. This restriction only impacts data extraction when a single mission is contained on two tapes because of limited storage capacity on the Tyndall computer. The user must obtain a dedicated disk pack for two mission tapes.

The results of the work performed on this contract verify the production capability of the MOAOPS and BOOM-MAP programs for extracting and analyzing data from TACTS/ACMI data tapes. Output from the BOOM-MAP program in terms of supersonic and boom producing flight track maps and noise contour maps, provide the environmental and range planner with important and useful tools to analyze MOA operations.

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SECTION 1. OVERVIEW

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The MOAOPS program extracts information from TACTS/ACMI mission standard data tapes and compiles a library of information concerning the supersonic operations. The BOOM-MAP program calculates various statistics on the supersonic operations. It also calculates expected sonic boom levels on the ground based on the extracted information.

This work was accomplished using the Tyndall AFB Cyber 170 computer and Calcomp plotter. The two BBN programs, MOAOPS and BOOM-MAP, required modification before they could be used. Section 2 discusses the generation and modification of the supersonic data bases using the MOAOP program to extract and modify aircraft mission data from TACTS/ACMI mission tapes. Section 3 discusses the generation of output plots using the BOOM-MAP program to analyze the supersonic data bases and to generate the necessary input files for the General Purpose Contouring Program (GPCP II). Appendix A contains examples of

output from the MOAOPS program and includes mission and aircraft indexes for each MOA. Appendix B contains examples of output from the BOOM-MAP program and plots, depicting supersonic flight tracks, sonic boom producing flight tracks, overpressure contours, CSEL contours and CLDN contours obtained from the data bases. Plots are included for each MOA except Oceana. The BOOM-MAP program would not accept data from the Oceana LIBRY file. In addition, BOOM-MAP would not accept some of the data in the Tyndall LIBRY file. These two problems are being investigated by BBN Laboratories. The user is cautioned that all plots have been reduced for this report; therefore, the scale is not accurate. Additional information concerning MOAOP and BOOM-MAP can be found in the BBN User°s Guide written by Wilby [1].

SECTION 2 SUPERSONIC DATA BASE GENERATION AND MAINTENANCE

2.1 INTRODUCTION

This section will outline the procedures used to generate the supersonic data bases for Holloman, Luke, Oceana, Nellis and Tyndall MOAs. The MOAOP program actually consists of two separate programs: EXTRACT and DELETE. EXTRACT contains the code to extract data from the TACTS/ACMI mission tapes and DELETE is used to delete references from the INDEX file and to change mission names on existing index and library files. The EXTRACT program generates three files : two index files ("INDEX" and "MINDEX") and one library file ("LIBRY").

The MINDEX file contains a list of all mission numbers analyzed from TACTS/ACMI tapes. The MINDEX file serves as a record of missions analyzed and is updated when additional TACTS/ACMI tapes are read and when the DELETE program is run in the "CHANGE" mode. MINDEX is not used by the BOOM-MAP program. The INDEX file contains mission number, date, mission start and end time, TACTS/ACMI site name and number, aircraft type and tail number, the total number of records written to the LIBRY file, and the number of supersonic records written to the LIBRY file. The LIBRY file contains specific time, position, G load and velocity for each aircraft. Although aircraft information is recorded for each aircraft at 100 to 200 millisecond intervals, data was extracted from the TACTS/ACMI mission tapes at 1.5 second intervals. Only supersonic data was extracted from the TACTS/ACMI tapes. However, the EXTRACT program will still create a three record entry in the LIBRY file for non-supersonic data. These records can be deleted using the DELETE program but they will not cause any problems if they are left in the INDEX and LIBRY files.

2.2 File Management on the Tyndall Cyber

The Tyndall Cyber 170/730 computer, hereafter referred to as Cyber, current operating system is Nos 2.4.3 level 647. All permanent files on the Cyber are classified according to the manner in which they are accessed: indirect or direct access. These two access methods should not be confused with file types. The EXTRACT program generates two different file types: sequential and direct access. The INDEX and LIBRY files are direct access and the MINDEX file is sequential. The user is cautioned that a direct access type file e.g., an INDEX or LIBRY file cannot be altered with a text editor. You can examine a direct access file with the XEDIT editor but you must exit XEDIT with the "STOP" command. If you exit XEDIT with the "QUIT" command you may destroy the file key and render the file useless.

The access mode is determined by the command used to make the file permanent. How the file is made permanent also determines the command you must enter to access the file. If the user is not familiar with the permanent file storage and access commands they can be found in NOS Version 2 Reference Set, Volume 2. The INDEX and LIBRY files are usually stored as direct access permanent files while the MINDEX file is stored as an indirect access file. The Cyber has the NOS/BE "STORE" command installed which will automatically determine the storage method depending on file size. The user can store the MINDEX file as a direct access file.

2.3 Program EXTRACT

2.3.1 General Description

The EXTRACT program reads a TACTS/ACMI Mission Standard Data tape, extracts relevant information and appends this information to either a

new or existing data base. The TACTS/ACMI mission tapes contain data on up to 8 instrumented aircraft flying a mission on the MOA. Among the data collected is real time information on aircraft position, velocity and acceleration, updated at intervals of 100 to 200 milliseconds. The program extracts this data at approximately 1.5 second intervals in order to minimize both the time taken to read the tapes and the quantity of information to be stored. Storage capacity is extremely limited on the Cyber.

The number of tapes required to record an entire mission depends on the length of the mission and the number of aircraft involved. The EXTRACT program is designed to read data directly from TACTS/ACMI tapes; however, this is not possible on the Cyber. The TACTS/ACMI tape must be copied to a disk file before the data can be extracted. This does not cause any difficulty unless a single mission is on two tapes. Because of the size of the disk file generated by two TACTS/ACMI tapes, the user must obtain a dedicated disk pack and increased storage allocation from AFESC/SI. This assumes the user is using the Tyndall Cyber.

The information is then appended to either a new or an existing library file, which accumulates the information from all the mission tapes analyzed. The library file is indexed, so that a particular mission, aircraft type, etc., can be accessed by the sonic boom analysis program.

Two index files are formed. The mission index file (MINDEX) contains only the mission names, dates and site location for all the tapes analyzed. The second index (INDEX) contains information on every aircraft flying for every mission analyzed, such as aircraft type, aircraft tail number, starting and ending time of the mission.

Each entry in this index file is associated with a time series of data stored in the library file, and the appropriate record numbers for the library file access are stored in the index file. This index file is then used by the sonic boom analysis program to retrieve the appropriate flights to be analyzed.

During a mission, it is possible that changes may occur in the aircraft flying, or that erroneous data has been included in the mission tape and later corrected. The program detects any change in the number of aircraft flying, aircraft type or aircraft tail numbers and signifies the start of a new mission segment when this occurs. The index file contains one entry for each aircraft flying in each mission segment. The library file has an associated time series of data for each aircraft flying each mission segment.

Two choices are available for the data extraction program.

1. Only supersonic data ($M>0.99$)may be stored in the library file or all data (subsonic and supersonic) may be stored. It is important to keep the index and library files for these two cases distinctly separate, as the sonic boom analysis program uses only the supersonic data.

2. The sonic boom analysis program only requires data at time intervals of approximately 1.5 seconds for reasonable accuracy. However, an option in the data extraction program is available to read and store data in the library file at 100 or 200 millisecond intervals. The intention is to make it possible to analyze a few flight tracks in great detail if necessary. This option is not recommended for building a data base of many missions as the quantity of data could

become prohibitively large and should not be used for the BOOM-MAP data base.

In addition to the data extraction program, a program to delete entries from the index files has been written. The program does not delete any information from the library file, but deletes the index entry and all references giving access to the library information associated with the index entry. The index deletion feature is necessary in case mission tapes have been analyzed that should not form part of the permanent data base, or some index entries show errors that occurred on the TACTS/ACMI tapes.

2.3.2 Program EXTRACT Input Data

Only 5 lines are required for input, each in character form, contained in apostrophes.

1. 'SUPERSONIC DATA ONLY' or 'ALL DATA SELECTED'. The first option selects dynamic records for Mach number M>0.99. The second option selects subsonic and supersonic data, with no restriction on Mach number.
2. 'DATA AT =1 SECOND INTERVALS' or 'ALL DYNAMIC DATA'. The first option reads dynamic data records at approximately 1.5 second intervals. The second option reads all the dynamic data output at 100 or 100 millisecond intervals, but should not be used in forming the supersonic database for BOOM-MAP.
3. 'NEW INDEX AND LIBRARY FILES TO BE CREATED' or 'OLD INDEX AND LIBRARY FILES TO BE USED'. The first option is used only for the first mission tape analyzed in

starting the library and index files. The second option is used for the second mission tape analyzed and thereafter.

4. 'FULL INDEX PRINTED' or 'UPDATED INDEX ONLY'. As many tapes are analyzed, the index file may get quite large. The 'FULL' index prints the whole file, while 'UPDATED' prints only the mission currently being analyzed.

5. 'ONE = NUMBER OF FIRST TAPE REEL READ' or 'ANY = NUMBER OF FIRST TAPE REEL READ'. If the option 'ONE' is used, the program will stop unless tape reel number 1 is mounted. The option 'ANY', permits any reel number to be the first tape reel, but multiple tape reels must still follow in sequence.

2.3.3 Program EXTRACT Batch File Examples

The job control language (JCL) and the input data required to extract information from a TACTS/ACMI mission tape using the EXTRACT program is shown in Table 2.1. The batch file in Table 2.1 was used to analyze the first mission tape for the Tyndall MOA. The index and library files are all direct access permanent files because the "DEFINE" command was used to create them. Since the MINDEX is a small file it could have been declared an indirect access permanent file by using the "SAVE" command. It is up to the user to determine the permanent file storage type for the MINDEX file. As mentioned earlier the size of the INDEX and LIBRY file dictate that these files will be direct access permanent files. In this example, the file "EXTRACT" in the statement "GET, LGO = EXTRACT", is the executable code for the program EXTRACT. The user can compile the DELETE PROGRAM for each run

```
/JOB
SPECTUM,T400.
/USER
CHARGE(*)
SETTL,5000.
*
*   CREATION BATCH FILE FOR TYNDALL
*
DEFINE,INDEX=TYNIDEX.
DEFINE,LIBRY=TYNLIB.
DEFINE,MINDEX=TYNMDEX.
LABEL,TAPE,VSN=000004,NT,D=PE,LB=KU,F=L,PO=R.
COPY,I=TAPE,O=TAPE1,BS=2000.
UNLOAD,TAPE.
REWIND,TAPE1.
GET,LGO=EXTRACT.
LDSET,PRESET=ZERO.
LGO(*PL=30000)
RETURN,TAPE1,MINDEX,INDEX,LIBRY.
DAYFILE.
REWIND,OUTPUT.
ROUTE,OUTPUT,DC=PR.
/EOR
'SUPERSONIC DATA ONLY'
'DATA AT>1 SECOND INTERVALS'
'NEW INDEX AND LIBRARY FILES TO BE USED'
'FULL INDEX PRINTED'
'ANY = NUMBER OF FIRST TAPE REEL READ'
/EOF
```

Table 2.1 Batch file for a creation run.

but is not as efficient as using the LGO FILE. An example of a batch file to update the Tyndall MOA file is depicted in Table 2.2. The only change required in the input data is to change "new" to "old" in the third line. In the JCL, the "DEFINE" commands have been replaced by "ATTACH" commands because the files were created on the initial run.

2.3.4 Program EXTRACT Output Data

Examples of the output from program EXTRACT are given in Appendix A. Table A-1 contains information on the mission tape being analyzed and includes any warning messages that may occur during the analysis. These include parity errors, unidentified block types, etc., which may be useful to determine if the data in a mission segment is suspect. This table should be scrutinized to determine whether any mission segments should be deleted from the index at a later date. The possible reasons for deletions are:

1. Obvious errors in aircraft data, such as omission of A/C type.
2. Many parity errors, indicating a poor quality tape and insufficient data.
3. False start of a mission (due to data omission or poor tape) giving a very short initial mission segment, which could be ignored.
4. No supersonic activity.

Table A-2 is a direct echo of the information stored on the library file and has been deliberately left in the same format.

Table A-3 is a listing of the index file, either the FULL index or the UPDATED index only (the mission currently being analyzed), as specified by the input.

```
/JOB
SPECTUM,T400.
/USER
CHARGE(*)
SETTL,5000.
*
*   UPDATE BATCH FILE FOR TYNDALL
*
ATTACH,INDEX=TYNIDEX/M=W.
ATTACH,LIBRY=TYNLIB/M=W.
ATTACH,MINDEX=TYNMDEX/M=W.
LABEL,TAPE,VSN=000004,NT,D=PE,LB=KU,F=L,PO=R.
COPY,I=TAPE,O=TAPE1,BS=2000.
UNLOAD,TAPE.
REWIND,TAPE1.
GET,LGO=EXTRACT.
LDSET,PRESET=ZERO.
LGO(*PL=30000)
RETURN,TAPE1,MINDEX,INDEX,LIBRY.
DAYFILE.
REWIND,OUTPUT.
ROUTE,OUTPUT,DC=PR.
/EOR
'SUPERSONIC DATA ONLY'
'DATA AT>1 SECOND INTERVALS'
'OLD INDEX AND LIBRARY FILES TO BE USED'
'FULL INDEX PRINTED'
'ANY = NUMBER OF FIRST TAPE REEL READ'
/EOF
```

Table 2.2 Batch file for an update run.

Table A-4 is a listing of the mission tapes analyzed for the database.

The remainder of Appendix A contains current index and mission index files for all five MOAs that were created under this contract.

2.4 Program DELETE

2.4.1 General Description

The DELETE program operates in one of two modes: the "delete" mode and the "change" mode. When using the DELETE program to delete data from the index file, the job should be run in the batch mode. The "change" option should be run interactively. In order to delete data on a specific mission or aircraft from the database 'LIBRY', created using program EXTRACT, it is only necessary to delete all references to that specific data from the index files 'INDEX' and 'MINDEX'. The program DELETE reads the existing files 'INDEX' and 'MINDEX', modifies them as selected by the input and outputs new files 'INDEXN' and 'MINDEXN' in the same format with the appropriate index entries deleted.

The file 'INDEXN' should again be defined as a direct access file for permanent storage if the file 'INDEX' was previously so defined. The users' permanent file names used for storing the existing files 'INDEX' and 'MINDEX' and the new modified 'INDEXN' and 'MINDEXN' files should differ. On completion of the program, the output will list the index entries deleted and this output should be checked before purging the old 'INDEX' file and thus permanently preventing access to the deleted entries. Typically the deletions will not be necessary until the database is to be accessed by the BOOM-MAP program. A copy of the full, unmodified index should be kept on the back-up magnetic tape.

The DELETE program can also be used to change mission names in the "LIBRY" and "INDEX" files. This feature is extremely useful if you want to analyze data for a particular type of mission. The change mode will allow you to change selected mission names. The requested mission names are changed in the "INDEX" and "LIBRY" files as well as the date and time in the first record of these two files. Only the date and time in the first record is changed in the new "MINDEX" file. The change mode is designed to be operated interactively. A record of all changes made during the session are written to a local file named "TAPE1". An example of file TAPE1 will be shown later in Section 2.4.3. This file should be reviewed before the old "LIBRY" and "INDEX" files are purged and the new files catalogued.

2.4.2 Program DELETE Input Data for the "delete" Mode

The data for the "delete" mode is input in character strings or integers, one entry per line. All character strings must be enclosed within single quotation marks.

'MISSION NAMES TO BE DELETED'	(Max No. 25)
'5203-15'	An example of a mission name.
.	This must match exactly the entries in
.	the mission index and library index
.	files.
.	

'ENTRY NUMBERS TO BE DELETED' (Max No. 50)

1	Examples of entries to be deleted, one
.	number per line.
.	
.	
45	These refer to the INDEX file line
.	numbers.
.	
.	
39	
/EOF	End of file mark, signified end of entries.

When running the DELETE program in the "change" mode the user will be prompted for the input. The program asks you to verify that the correct files were attached. The program then asks for the "INDEX" file entry number of the mission name you want to change. After confirming the correct mission name, you are asked to enter the new mission name. The new mission name is written in the new "LIBRY" and "INDEX" files.

2.4.3 Program DELETE Batch File Example for "delete" Mode

Table 2.3 shows a sample batch file that can be used by the DELETE program in the "delete" mode. This example deletes mission numbers and particular entry numbers in the reference index file. In fact, this particular example deletes all non-supersonic data from the Tyndall INDEX file, TYNIDEX, listed in Table A-13. Notice that all character input data is enclosed in single quotation marks. The entry numbers should be left justified. There is no need to attach the

```
/JOB
SPECTUM,T400.
/USER
CHARGE(*)
SETTL,5000.
*
*   BATCH FILE FOR DELETE PROGRAM
*
ATTACH,INDEX=TYNIDEX.
ATTACH,LIBRY=TYNLIB.
GET,LGO=DELETER.
LDSET,PRESET=ZERO.
LGO(*PL=30000)
DAYFILE.
REWIND,OUTPUT.
ROUTE,OUTPUT,DC=PR.
/EOR
'MISSION NAMES TO BE DELETED'
'6074-1'
'6169-7'
'6170-7'
'6220-1'
'ENTRY NUMBERS TO BE DELETED'
9
13
14
19
34
35
37
39
40
41
42
44
46
47
52
54
/EOF
```

Table 2.3 Batch file for running the DELETE program using the delete mode.

library file because only the index file is modified; the actual data remains in the library file. Table 2.4 depicts the commands required to run the DELETE program in the "change" mode. The files "INDEXN" and "LIBRYN" are the new index and library files respectively, that are created. File "DELETER" is the binary executable file for the DELETE program. All files must be attached before the program is executed. The last batch command in Table 2.4, "DELETER" executes the program. Table 2.5 illustrates program prompts from a sample session. Although the "delete" mode can be run interactively, this part of the program is not menu driven. It is recommended that the "delete" mode be run only in the batch mode. When using the "change" mode the system prompt is a question mark (?). When answering the first prompt be sure to include your response in single quotation marks ('CHA'). The program uses the date and time of the INDEX and LIBRY files to verify that the correct files have been attached. To change a mission name you must enter the index file entry number for that particular mission. If there is more than one line number for that mission, each line must be entered separately. One line number entry will not change all entries with the same mission number.

If you enter the wrong line number you can enter "N" when the user is asked to verify if the correct mission name has been selected. If a mission number is out of range the program will not accept the number and will request another value. The program is terminated by entering a zero (0) for the line number. During the execution of the program all transactions have been recorded on a local file called TAPE1. This file should be reviewed before discarding the old INDEX and LIBRY files. Of course, the old files can also be retained if the user wants to keep them. Table 2.6 is an example of file TAPE1.

```
/ATTACH,INDEX=CEAIDEX/M=R
/DEFINE,INDEXN=NEWIDEX
/ATTACH,LIBRY=CEALIB/M=R
/DEFINE,LIBRYN=NEWLIB
/ATTACH,MINDEX=CEAMDEX/M=R
/GET,DELETER
/DELETER
```

Table 2.4 List of batch commands required to run DELETE in the 'change' mode.

```
*****************************************************************************
*****************************************************************************

RUN PROGRAM DELETE TO DELETE INDEX ENTRIES AND/OR MISSION NAMES OR TO
CHANGE THE MISSION NAME. THE CHANGE MODE IS RUN INTERACTIVELY
WHILE THE DELETE MODE IS RUN AS A BATCH JOB.

ENTER(INCLUDE QUOTES):
    'CHA' - TO RUN THE CHANGE MODE
    'MIS' - TO RUN THE DELETE MODE (NOT MENU DRIVEN)
? 'CHA'

ORIGINAL INDEX BEFORE CHANGES. DATE 86/06/24. TIME  13.37.36.

ORIGINAL LIBRY FILE BEFORE CHANGES. DATE 86/06/24. TIME  13.37.36.

ARE THE ABOVE FILES THE ONES YOU WANT (Y/N)?
? Y

COPYING THE INDEX FILE FROM INDEX TO INDEXN.

COPYING THE LIBRY FILE FROM LIBRY TO LIBRYN.

ENTER THE INDEX FILE ENTRY NUMBER OF THE MISSION NAME TO BE CHANGED.
ENTER 0 TO EXIT THE CHANGE MODE.
? 1

THE CURRENT MISSION NAME FOR ENTRY     1 IS: LAA603120639
STARTING TIME: 0919 5436     A/C NO. & TYPE: 39 F-4
IS THIS THE CORRECT ENTRY (Y/N)?
? Y

ENTER NEW MISSION NAME -- MAX 16 CHARACTERS LEFT JUSTIFIED:
----------------
? DACT

MISSION NAME IS: DACT
IS IT OKAY (Y/N)?
? Y

LIBRY FILE MISSION NAME IN RECORD      2 IS: LAA603120639
IS THIS THE CORRECT RECORD (Y/N)?
? Y

MISSION NAME: LAA603120639          HAS BEEN REPLACED BY
MISSION NAME: DACT                  IN THE INDEX AND LIBRY FILES.
```

Table 2.5. Sample Interactive Session Using the CHANGE Mode of the DELETE Program.

```
  ENTER THE INDEX FILE ENTRY NUMBER OF THE MISSION NAME TO BE CHANGED.
  ENTER Ø TO EXIT THE CHANGE MODE.
? 3

  THE CURRENT MISSION NAME FOR ENTRY    3 IS: LAA603120639
  STARTING TIME: 0919 5436    A/C NO. & TYPE: 59
  IS THIS THE CORRECT ENTRY (Y/N)?
? Y

  ENTER NEW MISSION NAME -- MAX 16 CHARACTERS LEFT JUSTIFIED:
  ----------------
? BFM

  MISSION NAME IS: BFM
  IS IT OKAY (Y/N)?
? Y

  LIBRY FILE MISSION NAME IN RECORD    82 IS: LAA603120639
  IS THIS THE CORRECT RECORD (Y/N)?
? Y

  ENTER THE INDEX FILE ENTRY NUMBER OF THE MISSION NAME TO BE CHANGED.
  ENTER Ø TO EXIT THE CHANGE MODE.
? 8

  THE CURRENT MISSION NAME FOR ENTRY    8 IS: LAA603110630
  STARTING TIME: 0918 2095    A/C NO. & TYPE: 36 F-14
  IS THIS THE CORRECT ENTRY (Y/N)?
? N


  ENTER THE INDEX FILE ENTRY NUMBER OF THE MISSION NAME TO BE CHANGED.
  ENTER Ø TO EXIT THE CHANGE MODE.
? 15

  THE CURRENT MISSION NAME FOR ENTRY   15 IS: LAA603110630
  STARTING TIME: 0914 1392    A/C NO. & TYPE: 59
  IS THIS THE CORRECT ENTRY (Y/N)?
? N

  ENTER THE INDEX FILE ENTRY NUMBER OF THE MISSION NAME TO BE CHANGED.
  ENTER Ø TO EXIT THE CHANGE MODE.
? 55

  ENTRY NUMBER    55 IS OUT OF RANGE - TRY AGAIN]

  ENTER THE INDEX FILE ENTRY NUMBER OF THE MISSION NAME TO BE CHANGED.
  ENTER Ø TO EXIT THE CHANGE MODE.
? Ø

  CHECK LOG ON FILE TAPE1 BEFORE PURGING THE OLD FILES.

  DO NOT FORGET TO REPLACE THE MINDEXN FILE
  AND PURGE THE MINDEX, INDEX AND LIBRY FILES, AS NEEDED.
   STOP  6666
```

Table 2.5. Continued

ORIGINAL INDEX BEFORE CHANGES. DATE 06/06/24. TIME 13.37.36.
0 16SUP 06/06/24. 13.37.36.

1	LAA603120639	03/12/06 3OCEANA	0919543609472212 39F-4	94TH	2	13	10
2	LAA603120639	03/12/86 3OCEANA	0919543609472212 36F-14	94TH	15	67	64
3	LAA603120639	03/12/86 3OCEANA	0919543609472212 59	VF-4	82	21	18
4	LAA603120639	03/12/86 3OCEANA	0919543609472212 58	VF-4	103	46	43
5	LAA603120639	03/12/86 3OCEANA	0919543609472212 59	VF-4	149	55	52
6	LAA603100619	03/10/86 3OCEANA	1039597511215513 39F-4	71ST	204	257	254
7	LAA603110630	03/11/85 3OCEANA	0914139209182065 36F-14	94TH	461	3	0
8	LAA603110630	03/11/86 3OCEANA	0918209509444429 36F-14	94TH	464	3	0
9	LAA603110630	03/11/86 3OCEANA	0914139209182065 39F-4	94TH	467	3	0
10	LAA603110630	03/11/86 3OCEANA	0918209509444429 36F-14	94TH	470	3	0
11	LAA603110630	03/11/86 3OCEANA	0914139209182065 59	VF-4	473	3	0
12	LAA603110630	03/11/86 3OCEANA	0918209509444429 59	VF-4	476	52	49
13	LAA603110630	03/11/86 3OCEANA	0914139209182065 59	VF-4	528	3	0
14	LAA603110630	03/11/86 3OCEANA	0918209509444429 59	VF-4	531	7	4
15	LAA603110630	03/11/86 3OCEANA	0914139209182065 59	VF-4	538	3	0
16	LAA603110630	03/11/86 3OCEANA	0918209509444429 59	VF-4	541	4	1

LOG OF DELETE PROGRAM CHANGE MODE RUN:

MISSION NAME: LAA603120639 HAS BEEN REPLACED BY
MISSION NAME: DACT IN THE INDEX AND LIBRY FILES.

MISSION NAME: LAA603120637 HAS BEEN REPLACED BY
MISSION NAME: BFM IN THE INDEX AND LIBRY FILES.

```
*******************************
*  INDEX FILE TO LIBRARY TAPE *
*     FULL INDEX:  86/10/15.  *
*                  13.03.00.  *
*     SUPERSONIC DATA ONLY    *
*******************************
```

ENTRY NO	MISSION NAME	MISSION DATE	SITE NO	LOCATION	STARTING TIME HR M SEC	FINISHING TIME HR M SEC	A/C TYPE	A/C TAIL NO	STARTING RECORD NO	NO OF RECORDS	NO OF SUPERSONIC RECORDS
1	DACT	03/12/86	3	OCEANA	0919 5436	0947 2212	39 F-4	94TH	2	13	10
2	LAA603120639	03/12/86	3	OCEANA	0919 5436	0947 2212	36 F-14	94TH	15	67	64
3	BFM	03/12/86	3	OCEANA	0919 5436	0947 2212	59	VF-4	82	21	18
4	LAA603120639	03/12/86	3	OCEANA	0919 5436	0947 2212	58	VF-4	103	46	43
5	LAA603120639	03/12/86	3	OCEANA	0919 5436	0947 2212	59	VF-4	149	55	52
6	LAA603100619	03/10/86	3	OCEANA	1039 5975	1121 5513	39 F-4	71ST	204	257	254
7	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	36 F-14	94TH	461	3	0
8	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	36 F-14	94TH	464	3	0
9	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	39 F-4	94TH	467	3	0
10	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	36 F-14	94TH	470	3	0
11	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	59	VF-4	473	3	0
12	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	59	VF-4	476	52	49
13	LAA603110630	03/11/85	3	OCEANA	0914 1392	0918 2065	59	VF-4	528	3	0
14	LAA603110630	03/11/86	3	OCEANA	0918 2075	0944 4429	59	VF-4	531	7	4
15	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	59	VF-4	538	3	0
16	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	59	VF-4	541	4	1

Table 2.6. Example of TAPE 1 Produced by the "CHANGE" Mode of the DELETE Program.

```
PRINT THE FIRST LIBRY RECORD FOR EACH MISSION:

THE FIRST TWO FIELDS ARE THE LIBRY INDEX ENTRY NUMBER AND
THE FIRST LIBRY FILE RECORD NUMBER FOR THAT MISSION SEGMENT.

 INDEX  LIBRY   MISSION              MISSION     START      A/C      A/C
 ENTRY  START   NAME                  DATE       TIME       TYPE     TAIL NO

   1       2    DACT                 03/12/86   0919 5436   F-4       94TH
   2      15    LAA603120639         03/12/86   0919 5436   F-14      94TH
   3      82    BFM                  03/12/86   0919 5436             VF-4
   4     103    LAA603120639         03/12/86   0919 5436             VF-4
   5     149    LAA603120639         03/12/86   0919 5436             VF-4
   6     204    LAA603100619         03/10/86   1039 5975   F-4       71ST
   7     461    LAA603110630         03/11/86   0914 1392   F-14      94TH
   8     464    LAA603110630         03/11/86   0918 2095   F-14      94TH
   9     467    LAA603110630         03/11/86   0914 1392   F-4       94TH
  10     470    LAA603110630         03/11/86   0918 2095   F-14      94TH
  11     473    LAA603110630         03/11/86   0914 1392             VF-4
  12     476    LAA603110630         03/11/86   0918 2095             VF-4
  13     528    LAA603110630         03/11/86   0914 1392             VF-4
  14     531    LAA603110630         03/11/86   0918 2095             VF-4
  15     538    LAA603110630         03/11/86   0914 1392             VF-4
  16     541    LAA603110630         03/11/86   0918 2095             VF-4

                                            *************************
                                            *  MISSION INDEX FILE   *
                                            *  UPDATED:  86/10/15.  *
                                            *            13.03.01.  *
                                            * SUPERSONIC DATA ONLY  *
                                            *************************

                                          MISSION      MISSION     SITE
                                           NAME         DATE      LOCATION

                                        LAA603120639   03/12/86   OCEANA
                                        LAA603100619   03/10/86   OCEANA
                                        LAA603110630   03/11/86   OCEANA

CHECK THE ABOVE MISSION NAME CHANGES BEFORE
PURGING THE OLD MINDEX, INDEX, AND LIBRY FILES.

DON'T FORGET TO REPLACE THE 'MINDEXN' FILE.

EXIT THE CHANGE MODE VERSION OF THE DELETE PROGRAM.

PROGRAM ENDS.
```

Table 2.6. Continued.

This particular example was generated using the session depicted in Table 2.5.

3.0 BOOM-MAP, SUPERSONIC AIRCRAFT ACTIVITY SUMMARY AND BOOM STRENGTH PREDICTION PROGRAM

3.1 General Description

The BOOM-MAP data analysis computer program accesses the TACTS/ACMI database generated by the MOAOPS computer program discussed in Section 2.0. The data analysis program produces statistical and graphic output describing aircraft position parameters as well as various measures of predicted boom strength. This program utilizes the data available in the TACTS/ACMI flight data library to produce graphic and tabular descriptions of MOA range activity.

Tabular output are produced by the BOOM-MAP program and are output directly to the line printer. To produce graphic output, BOOM-MAP creates a file compatible with California Computer Products' (CALCOMP) General Purpose Contouring Program (GPCP II). GPCP II reads this file and generates the necessary plotter directives on file TAPE II to produce hard copy graphic output.

Users control the database subset to be extracted from the library run through the use of an input data file. Through this file the user specifies:

1) the name(s) of the MOA ranges to be considered
2) mission names <u>or</u> dates
3) bounding times of day
4) aircraft types (specific tail numbers optional).

Users also specify desired output products. These include:

1) A statistical summary of position, speed, and boom strength variables. This summary includes distribution functions of range x-coordinates and y-coordinates, and the aircraft z-coordinate

(height above the range), all in feet. It also includes a distribution function of effective height (h_e). Distribution functions of Mach number, cutoff Mach number and effective Mach number are also presented. Estimated boom strength distribution functions include peak overpressure (in pounds per square foot), the peak overpressure (in dB, re: 20 microPascals), and the A-weighted sound exposure level (in dB). The estimated boom strength are those calculated directly below the extended aircraft flight trajectory. Also included are root mean square values for effective height, Mach number, effective Mach number, and cutoff Mach number.

2) A flight track map depicting ground projections of flight paths during supersonic activity.

3) A flight track map depicting ground projections of flight paths during sonic boom producing activity.

4) A noise contour map of average C-weighted sound exposure levels (CSEL).

5) A noise contour map of C-weighted day/night average levels (CLDN), requiring input of the reference number of daytime operations which will be used to convert CSEL to CLDN.

6) A noise contour map of flight averaged peak over-pressures (in pounds per square foot).

Figure 3.1 presents a functional block diagram of the BOOM-MAP software package. The user supplied directives (described in detail in this section) are read first and stored in memory. Information on the library entries are then read one at a time from the library index file and the sortie parameters compared with the qualifiers

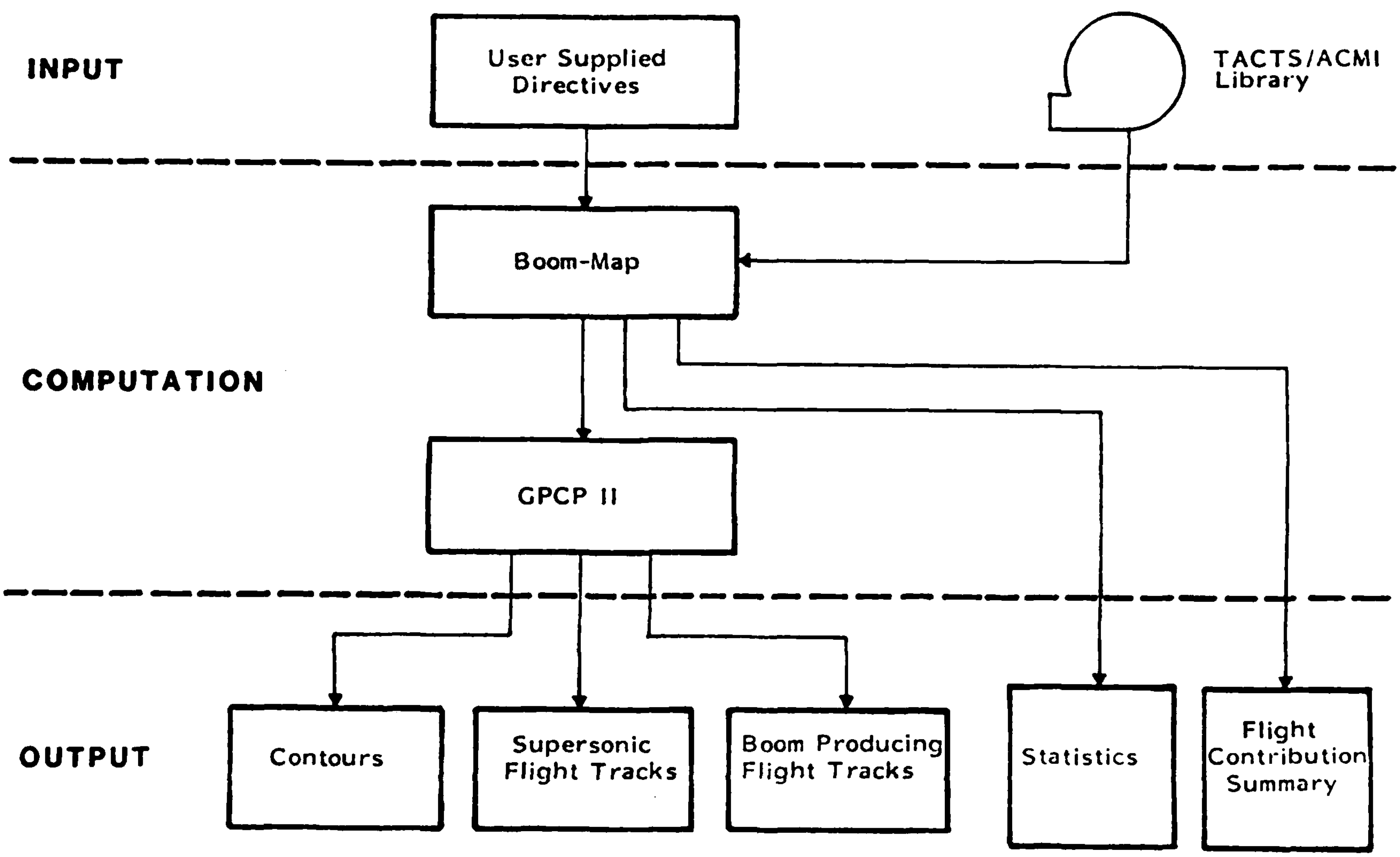

Figure 3.1. Functional Relationships Between Elements of BOOM-MAP Compute Program.

provided by the user in the input directives. When a library sortie meets the screening criteria, its time history file is read from the library and the flight is processed by the BOOM-MAP program. A journal is concurrently output to the line printer (one line per sortie) which identifies the mission name, the date, the site location, the sortie starting and ending times, the aircraft type and tail number, the amount of supersonic time and the amount of boom producing time. This journal presents users with a complete listing of all qualifying sorties.

Processing of library data stops when all entries in the index file have been searched.

When the library index has been exhausted, the program prints the statistical summary tables (if requested) and then prepares an output file to the contouring and plotting program, GPCP II. The BOOM-MAP program then terminates. When GPCP II is called, the file prepared by BOOM-MAP (TAPE11) provides a complete input directive list to GPCP. GPCP then produces flight track and contour maps as requested by the user.

The files required for input or output by the BOOM-MAP program are

1) Index file "INDEX" - direct access, record length 98

2) Database file "LIBRY" - direct access, record length 70

3) Two temporary output files TAPE3 and TAPE4 - sequential

4) Output file for input to GPCP II program, TAPE11 - sequential

3.2 BOOM-MAP INPUT DATA

This section presents a user's guide for operating the BOOM-MAP program. The guide describes the file of input cards necessary to control a BOOM-MAP run.

The complete run specification consists of three groups of information. These groups are:

1) a title card which is printed on all output products.
2) qualifiers used to control the particular flights extracted from the library.
3) specifiers used to control the particular output products required by the user.

All input file data cards are free format. That is, data is not restricted to particular card columns. Instead, a key word at the beginning of the card specifies the type of data to follow, and parameter values are simply separated by commas in most cases. Spaces between parameters are ignored and if the parameter list exceeds the 80 column allowable card width, the user may continue on the next card without the need for any special continuation characters.

3.2.1 TITLE Card

This card must be the first card in the input file. The key word "TITLE" followed by a space tells the program to accept up to 70 characters for a title. This title will be printed on all output products. The format is:

```
TITLE    title of run
```

3.2.2 Library Data Qualifier Cards

Access to the information stored in the database library is through the use of qualifier cards. These qualifier cards allow the

user to specify criteria for records that are to be included for analysis. The input file may contain from one to five "packets" of qualifiers, where a packet consists of four of the six available qualifier input cards. The input cards are "SITE", "MISSION", "DATE", "TIME", "AIRCRAFT" and "ACWTN". "ACWTN" is the qualifier to call for aircraft with tail numbers. The input cards must correspond with the following sequence.

"SITE"

"MISSION" or "DATE"

"TIME"

"AIRCRAFT" or "ACWTN"

Each input card is followed by one or more parameters separated by a comma or by the word "ALL". The maximum number of parameters allowed is based on the input card. Note that when specific parameters (e.g., missions, aircraft, etc.) are specified they must match exactly the way they are stored in the library index, character for character. In addition, if a sortie qualifies in more than one way with the user input directives it will still be included only once in the analysis.

CARD I: (SITE)

The SITE card allows the specification of 1 or more MOA site location names in the input file. The user is allowed a maximum of 20 site location names separated by commas. Site names can occur on more than one line if necessary.

Example: SITE Loc 1, Loc 1, Loc 3,...Loc 20

SITE Loc 1, Loc 2,

Loc 3, ...Loc 20

The parameter "ALL" is used when all site locations are to be included.

Example: SITE ALL

CARD II: (MISSION or DATE)

The input card "MISSION" allows the specification of one to ten mission names separated by commas. Mission names may occur on more than one line if necessary.

Example: MISSION Name 1, Name 2,...Name 10

-or-

MISSION Name 1,

Name 2,...Name 10

The parameter "ALL" is used when all Missions are to be included. When the user specifies the "MISSION" card instead of the "DATE" card for input Card II, all dates are considered legal. Once "MISSION" is specified in a packet "DATE" is no longer legal.

The input card "DATE" allows for the specification of one to ten date intervals separated by a comma. Date intervals may occur on more than one line. A date interval consists of a start date followed by a hyphen followed by an end date or simply a start date. All dates must appear as MM/DD/YY format. If only a start date is given, then the end date will be considered identical to the start date.

Example: DATE 01/21/85-02/1/85, 4/8/85,

7/18/86-7/19/86

The parameter "ALL" may be used when all dates are to be included. When the user specifies the "DATE" card instead of the

"MISSION" card as input card II, "MISSION" is no longer legal within that packet.

CARD III (TIME)

The input card "TIME" allows for the specification of one to ten time intervals separated by commas. Time intervals may occur on more than one line. A time interval consists of a start time followed by a hyphen followed by an end time or simply a start time. All times must appear as HHMM format. If only a start time is given, then the end time will default to 2359.

Example TIME: 1100-1200, 1300-1330

1400-1500, 1700

The parameter "ALL" is used when all time intervals are to be included.

CARD IV: AIRCRAFT OR ACWTN

Aircraft may be specified in two ways; either by aircraft type alone, or by a specific aircraft type and tail number.

The input card "AIRCRAFT" allows the specification of one or more aircraft types in the input file. The user is allowed a maximum of ten aircraft types separated by commas. Aircraft types may occur on more than one line. Once "AIRCRAFT" has been specified, "ACWTN" is no longer legal within that packet. The parameter "ALL" may be used when all aircraft types are to be included. When using the parameter "ALL" on the "AIRCRAFT" card, be sure that there are no blank aircraft type entries in INDEX file. If there are INDEX entries without an aircraft type, either specify aircraft type on the "AIRCRAFT" card or use the DELETE program to delete that particular entry in the INDEX file. The aircraft type is required to compute peak overpressure values. Although the program will run, the results may not be accurate. The

aircraft type must exactly match aircraft types in the "INDEX" files. For Example: "F15" will cause an error because it is represented as "F-15" in the "INDEX" files.

Example: AIRCRAFT Type 1, Type 2, Type 3,
Type 4...

Example: AIRCRAFT ALL

The input card "ACWTN" allows the specification of one or more aircraft types followed by their corresponding tail numbers. The user is allowed a maximum of ten aircraft/tail number pairs separated by commas. Aircraft/tail number pairs may continue on more than one line.

Example: ACWTN AC1 TN1, AC2 TN2,
AC3 TN3

The parameter "ALL" may be used when all aircraft types and tail numbers are considered legal. Once "ACWTN" has been used, "AIRCRAFT" is no longer considered legal. If the user specified "AIRCRAFT" as input card IV, then all tail numbers are considered to be legal.

3.2.3 Output Product Specification Cards

The type of output data desired by the user is specified by one or more output specification cards. These cards may be entered in any order.

"STATS" Card

This card tells the program to print a full statistics summary. An example of this summary is shown in Tables B-1 through B-5 and includes distribution functions of x, y, and z position variables, effective height, Mach number, and estimated boom strength (directly

below the aircraft). Also included are RMS values of effective height, Mach number, cutoff Mach number, and effective Mach number.

"MACHTRK" Card

This card directs the program to generate a flight track map showing those portions of sortie flight tracks where the aircraft Mach number exceeded 1.0. This card contains one numeric parameter which specifies the map scale ratio. For example, to produce a map of one inch equals 10,000 feet the scale ratio is 120,000.

The smallest scale factor possible is 1:2600 feet dictated by the numerical input limitations to GPCP. The largest realistic scale factor is 1:45,000 feet, giving a plot approximately 5"x 5" in size.

Example: MACHTRK 120000

"BOOMTRK" Card

This card directs the program to generate a flight track map showing those portions of sortie flight tracks where sonic booms were generated which propagated to the ground. This card contains a numeric parameter specifying the map scale ratio. For example, a map of one inch equals 10,000 feet is specified by a scale ratio of 120,000.

Example: BOOMTRK 120000

"CONTOUR" Cards

Contour cards are used to direct the program to produce maps depicting contours of equal boom strength. Three different types of contour maps may be specified: (1) CSEL, (2) CLDN, and (3) peak overpressure, in psf. The CONTOUR cards contain a number of parameters which must be entered in a specific order.

CSEL contour maps are specified using the keyword CONTOUR followed by CSEL. Additional parameters must be separated by commas, and must be input in the following order. The first is the scale ratio of the contour map (see MACHTRK or BOOMTRK cards for a description of the scale ratio). Following the scale ratio at least one (up to a maximum of 20) CSEL contour values must be specified.

Example: CONTOUR CSEL, 120000, 95, 100, 105

Peak overpressure contour maps are specified using the keyword CONTOUR followed by PKOP. Additional parameters must be separated by commas, and are input in the same order as with CSEL contours. The first parameter is the scale ratio of the contour map. Following this parameter must be at least one (up to a maximum of 20) peak overpressure contour values in pounds per square foot. Fractional values are acceptable but the program rounds the user specified values to the nearest tenth of a psf for plotting purposes.

Example: CONTOUR PKOP, 120000, 0.5, 0.8, 1.0, 2.0

CLDN contour maps are specified using the keyword CONTOUR followed by CLDN. Additional parameters must be separated by commas and must be input in the following order. The first parameter is the map scale ratio. The second parameter is the reference number of daytime operations which will be used on a 10 log (N) basis to convert CSEL values to CLDN. Following these two parameters must be at least one (up to a maximum of 19) CLDN contour values to be plotted.

Example: CONTOUR CLDN, 120000, 44.5, 55, 60, 65, 70, 75

"WIDTH" Card

The WIDTH card contains a single parameter which tells the plotting software the paper width (in inches) of the plotting device

used for the map output products. If the paper width is too narrow to accommodate the entire map, the plot software will automatically split the map into several panels which can then be assembled to form the full size map. This card may appear anywhere amongst the output product specification cards or immediately preceding them. The default width if this card is omitted is 34 inches. The default value was changed from 36 inches contained in the original BBN program delivered to the Air Force. Thirty-four inches is the maximum plotting area available on the Tyndall Calcomp plotter.

Example: WIDTH 30

3.2.4 Input Example

The following are examples of input data. The first example is a simple case. The second example shows effective use of the data qualifier cards.

Example 1: Shown below is the input data deck for a relatively simple case:

```
TITLE      NELLIS MOA -- ALL ACTIVITY

SITE       NELLIS
MISSION    ALL
TIME       ALL
AIRCRAFT   ALL

STATS
MACHTRK    96000
```

In this example the title printed on all output is "NELLIS MOA -- ALL ACTIVITY".

The processing software will utilize data only from the NELLIS MOA site. It will, however, select all missions, times of day, and aircraft types. For output products the statistics package will be printed and a map showing flight tracks where aircraft exceeded Mach 1.0 will be plotted to a scale of 1 inch equals 8000 feet.

Example 2: In this example more explicit input qualifiers have been specified.

TITLE	HOLLOMAN MOA
SITE	HOLLOMAN
MISSION	5284711-14DA, 5282717-20GI
TIME	0700-2159
AIRCRAFT	F-15, F-4
SITE	HOLLOMAN
MISSION	5282723-26RO
TIME	0700-2159
AIRCRAFT	ALL
BOOMTRK	9600
CONTOUR	CSEL 96000, 95, 100, 105
CONTOUR	CLDN 9600, 15.2, 65, 70, 75

In this example the title "HOLLOMAN MOA" will be printed on all output products. In contrast to the first example, the program will be fairly selective about the data it extracts from the library. Two packets of data qualifiers are included. Thus the program will select data from the library when either of the two packet conditions are met. It will select data when

a) the site name is HOLLOMAN, and the mission numbers are 5284711-14DA or 5282717-20GI, and the mission starting time is between 0700 and 2159, and the aircraft type is an F-15 or F-4.

or when

b) the site name is HOLLOMAN, and the mission name is 5282723-26RO, and the mission starting time is between 0700 and 2159 for any aircraft sortie meeting these conditions.

The output products will include a flight track map of boom producing track segments to a scale of 1 inch equals 8000 feet. Two contour maps will be plotted. The first will be a CSEL contour map to a scale of 1 inch equals 8000 feet, containing the 65, 70, and 75 dB contours. The second will be a CLDN contour map also plotted to a scale of 1 inch equals 8000 feet. The reference number of daily operations is 25.2 sorties and the desired contours are 65, 70 and 75 dB.

3.3 BOOM-MAP File Examples

Table 3.1 shows the JCL and data input for a sample BOOM-MAP case. Only the INDEX and LIBRY files need to be attached. Files TAPE 3 and TAPE 4 are temporary files containing grid data and can be saved if the user desires.

In this sample, TAPE11, the GPCPII plot file is saved for review as file UNIT11. If the user requests statistical output by including the "STATS" card, the output can be printed or saved as a disk file on both. File "BOOMLGO" is the binary executable file of the BOOM-MAP program. File TAPE9T is the executable file used by the CALCOMP plotter to generate the plots.

```
/JOB
SPECTUM.
/USER
CHARGE(*)
SETTL(5000)
SETASL(*)
SETJSL(*)
ATTACH,INDEX=TYNIDEX.
ATTACH,LIBRY=TYNLIB.
ATTACH,LGO=BOOM2GO.
MAP,ON.
MAP,PART.
LDSET(PRESET=ZERO)
LGO.
REWIND,TAPE11.
COPYBF,TAPE11,UNIT11.
STORE,UNIT11.
REWIND,TAPE11.
REWIND,TAPE3.
REWIND,TAPE4.
STORE,TAPE3.
STORE,TAPE4.
ATTACH,GPCP2/UN=APPLLIB/NA.
COPYEI,GPCP2,ABS,VERIFY.
RETURN,GPCP2.
REWIND,ABS.
ABS,TAPE11,JUNK.
REWIND,TAPE9.
COPYEI,TAPE9,TAPE9T,VERIFY.
STORE,TAPE9T.
STORE,JUNK.
DAYFILE.
REWIND,OUTPUT.
ROUTE,OUTPUT,DC=PR.
/EOR
/NOSEQ
TITLE  TYNDALL MOA - ALL MISSIONS AS OF 8/21/86
SITE  TYNDALL
MISSION  ALL
TIME  ALL
AIRCRAFT   F-4,F-15,F-16,F-18
MACHTRK  300000
MACHTRK  300000
BOOMTRK  300000
CONTOUR  CSEL,  300000, 105, 115, 125, 135, 145
CONTOUR  PKOP,  300000, 0.5, 1.0, 1.5, 2.0
CONTOUR  CLDN,  300000, 10, 55, 65, 75, 85
WIDTH 34.0
STAT
/EOF
```

Table 3.1 Batch file example to run BOOM-MAP.

3.4 BOOM-MAP Output

An example of BOOM-MAP output is shown in Appendix B. Table B-1 depicts the first output page echoes the input specification cards provided by the user. It also summarizes in table form the library qualifier information which will be used to select specific flight data from the library for processing. The second page echoes the specific flights selected from the data base which qualify for processing based on the user supplied input specifications and is shown in Table B-2.

The third page (Table B-3) contains distribution functions of distance, speed, and overpressure variables for times during which the aircraft Mach number is greater than cutoff. Each distribution function contains a number of histogram cells of specified cell size. the first and last cells are underrange and overrange cells used to collect the tails of the distribution which lie outside the expected range of the particular parameter. the remaining cells are of specific parameter range (identified as cell size in the printout).

For example, cell number N extends from

Lower bound - [lower band cell 2] + (N-2) [cell size]

to Upper bound = [lower band cell 2] + (N-1) [cell size]

Each cell contains the number of occurrences of the parameter in the cell range at one second intervals. That is, the number contained in cell N is the number of seconds the parameter was observed in the cell parameter range.

The eleven parameters, defined in Appendix A, are:

1) range x-coordinate in feet (range: -132,000 to +132,000 feet)
2) range y-coordinate in feet (range: -132,000 to +132,000 feet)
3) aircraft height above range center altitude in feet

(range: 750 to 50750 feet)

4) aircraft effective height, h_e, above range center altitude in feet (range: 0 to 50000 feet)

5) aircraft Mach number (range: 1.00 to 2.14)

6) aircraft cutoff Mach number (range: 1.00 to 2.14)

7) aircraft effective Mach number (range: 1.00 to 2.14)

8) boom strength overpressure under the projected flight path in pounds per square foot (range: 0.00 to 14.25 psf)

9) boom strength overpressure under the projected flight path in dB re: 20 micro Pascals (range: 115.0 to 153.5 dB)

10) C-weighted sound exposure level under the projected flight path in dB (range: 90.0 to 128.5 dB)

11) A-weighted sound exposure level under the projected flight path in dB (range: 80.0 to 118.5 dB)

The fourth and fifth pages shown in Table B-4 and B-5 respectively are a combined two-dimensional distribution function of the x/y range coordinates, parameters 1 and 2 on the previous page. This distribution function shows the spatial distribution of aircraft position during boom producing activity. Cells 1 and 52 in both dimensions are the underrange and overrange tails of the distribution. In the x-direction cells 1 through 30 are shown in the first half of the table; cells 31 through 52 in the second half.

Examples of the flight track and contour maps output by GPCP II for four MOAs are also shown. Map annotation in the title block indicates the type of map plotted. Range coordinates are plotted on the left and top of the map, and a cross is plotted at the range center (coordinates x = 0, y = 0). The y-axis points true north, and

the latitude and longitude of the range center are given in the title block.

REFERENCES

1. Wilby, E., Hornjeff, R., Bishop, E., User's Guide to MOAOPS and BOOM-MAP Computer Programs for Sonic Boom Research, BBN Report 6044, January 1986.

APPENDIX A

MOAOPS PROGRAM OUTPUT EXAMPLES

```
**************************************
*   MISSION NAME: 6218-7             *
*   MISSION DATE: 03/06/86           *
*  SITE LOCATION: 11 TYNDALL         *
*    REEL NUMBER: 1                  *
**************************************
```

MISSION SEGMENT	TYPE	STARTING TIME HR MIN SEC	FINISHING TIME HR MIN SEC	A/C NO	A/C TYPE	A/C TAIL NO	SEGMENT DURATION MIN SEC	% TIME SUPERSONIC
1	202	14:33 50.23	15:02 57.95	1	35 F-16	GRIF	29:08	.00
				2	35 F-16	GRIF	29:03	.00
				3	36 F-16	WHAM	29:08	.42
				4	36 F-16	WHAM	29:08	.00

NO OF RECORDS =   2340

*** END OF MISSION TAPE ***

Table A-1. Analysis of Mission Tape Analyzed.

```
LIBRARY TAPE LISTING, RECORD NO        942 ONWARDS

                                                    DIVE/CLIMB                      NORMAL
   TIME       MACH    RANGE  POSITIONS,FT            ANGLE    VELOCITY,FT/SEC      ACCEL
  HR M S       NO       X          Y         Z       (DEG)     X      Y      Z       G
 --------    -----  ------    ------    ------     -----   ----   ----   ----   -----

6218-7               03/06/8614335023F-16   GRIF
11TYNDALL     35 1 1 4SUP
15025795         3      0
6218-7               03/06/8614335023F-16   GRIF
11TYNDALL     35 1 2 4SUP
15025795         3      0
6218-7               03/06/8614335023F-16   WHAM
11TYNDALL     36 1 3 4SUP
   14410965 1.007   35503. -17598.   16933. -31.6   517. -704. -537.   .067
   14411095 1.045   37268. -18518.   16287. -32.8   501. -716. -563.   .627
   14411235 1.081   37957. -19529.   15472. -33.5   430. -738. -592. 1.005
   14411365 1.102   38565. -20504.   14712. -33.9   459. -759. -595.   .889
   14411495 1.102   39117. -21549.   13938. -27.5   400. -857. -493. 5.452
15025795         8      5
6218-7               03/06/8614335023F-16   WHAM
11TYNDALL     36 1 4 4SUP
15025795         3      0
```

Table A-2. Data Written to the LIBRY File.

INDEX FILE TO LIBRARY TAPE
FULL INDEX: 86/08/21.
03.22.49.
SUPERSONIC DATA ONLY

ENTRY NO	MISSION NAME	MISSION DATE	SITE NO	LOCATION	STARTING TIME HR M SEC		FINISHING TIME HR M SEC		A/C TYPE		A/C TAIL NO	STARTING RECORD NO	NO OF RECORDS	NO OF SUPERSONIC RECORDS
1	6074-1	03/17/86	11	TYNDALL	0743	1463	0743	1773	35	F-16	LANC	2	3	0
2	6074-1	03/17/86	11	TYNDALL	0743	1923	0759	3633	32	F-15	LANC	5	3	0
3	6074-1	03/17/86	11	TYNDALL	0743	1463	0743	1773	35	F-16	LANC	8	3	0
4	6074-1	03/17/86	11	TYNDALL	0743	1923	0759	3633	35	F-16	LANC	11	3	0
5	6074-1	03/17/86	11	TYNDALL	0743	1463	0743	1773	35	F-16	LANC	14	3	0
6	6074-1	03/17/86	11	TYNDALL	0743	1923	0759	3633	35	F-16	LANC	17	3	0
7	6074-1	03/17/86	11	TYNDALL	0743	1463	0743	1773	35	F-16	LANC	20	3	0
8	6074-1	03/17/86	11	TYNDALL	0743	1923	0759	3633	35	F-16	LANC	23	3	0
9	6073-9	03/14/86	11	TYNDALL	1522	4613	1549	4333	32	F-15	LANC	26	3	0
10	6073-9	03/14/86	11	TYNDALL	1522	4613	1549	4333	35	F-16	LANC	29	10	7
11	6073-9	03/14/86	11	TYNDALL	1522	4613	1549	4333	35	F-16	LANC	39	17	14
12	6073-9	03/14/86	11	TYNDALL	1522	4613	1549	4333	35	F-16	LANC	56	4	1
13	6073-9	03/14/86	11	TYNDALL	1522	4613	1549	4333	35	F-16	LANC	60	3	0
14	6169-6	06/18/86	11	TYNDALL	1117	5651	1146	4411	16	F-4	CMBT	63	3	0
15	6169-6	06/18/86	11	TYNDALL	1117	5651	1146	4411	19	F-4	CMBT	66	11	8
16	6169-8	06/18/86	11	TYNDALL	1353	0243	1429	3823	35	F-16	GRIF	77	5	2
17	6169-8	06/18/86	11	TYNDALL	1353	0243	1429	3823	32	F-15	GRIF	82	84	81
18	6169-8	06/18/86	11	TYNDALL	1353	0243	1429	3823	35	F-16	GPUD	166	7	4
19	6169-8	06/18/86	11	TYNDALL	1353	0243	1429	3823	32	F-15	GPUD	173	3	0
20	6169-7	06/18/86	11	TYNDALL	1307	5919	1339	0993	32	F-15	LANC	176	3	0
21	6169-7	06/18/86	11	TYNDALL	1307	5919	1339	0993	35	F-16	LANC	179	3	0
22	6169-7	06/18/86	11	TYNDALL	1307	5919	1339	0993	32	F-15	LANC	182	3	0
23	6169-7	06/18/86	11	TYNDALL	1307	5919	1339	0993	32	F-15	LANC	185	3	0
24	6170-7	06/19/86	11	TYNDALL	1221	2169	1259	2223	32	F-15	CUBI	188	3	0
25	6170-7	06/19/86	11	TYNDALL	1221	2169	1259	2223	35	F-16	CUBI	191	3	0
26	6170-7	06/19/86	11	TYNDALL	1221	2169	1259	2223	16	F-4	CMBT	194	3	0
27	6170-7	06/19/86	11	TYNDALL	1221	2169	1259	2223	16	F-4	CMBT	197	21	18
28	6170-1	06/19/86	11	TYNDALL	0743	3003	0818	2453	35	F-16	YUKO	218	89	86
29	6170-1	06/19/86	11	TYNDALL	0743	3003	0818	2453	32	F-15	YUKO	307	146	143
30	6170-1	06/19/86	11	TYNDALL	0743	3003	0818	2453	16	F-4	CMBT	453	37	34
31	6170-1	06/19/86	11	TYNDALL	0743	3003	0818	2453	19	F-4	CMBT	490	7	4
32	6199-3	07/18/86	11	TYNDALL	0927	1303	1000	2203	35	F-16	SPIK	497	221	218
33	6199-3	07/18/86	11	TYNDALL	0927	1303	1000	2203	32	F-15	SPIK	718	52	49
34	6199-3	07/18/86	11	TYNDALL	0927	1303	1000	2203	4	A-4	SPIK	770	3	0
35	6199-5	07/18/86	11	TYNDALL	1350	3557	1356	2627	32	F-15	AUDI	773	3	0
36	6199-5	07/18/86	11	TYNDALL	1356	2757	1422	3567	35	F-16	AUDI	776	47	44
37	6199-5	07/18/86	11	TYNDALL	1350	3557	1356	2627	32	F-15	GRND	823	3	0
38	6199-5	07/18/86	11	TYNDALL	1356	2757	1422	3567	32	F-15	GRND	826	17	14
39	6199-5	07/18/86	11	TYNDALL	1350	3557	1356	2627	4	A-4	AUDI	843	3	0
40	6199-5	07/18/86	11	TYNDALL	1356	2757	1422	3567	4	A-4	AUDI	846	3	0
41	6199-5	07/18/86	11	TYNDALL	1350	3557	1356	2627	2	A-4	GRND	849	3	0
42	6199-5	07/18/86	11	TYNDALL	1356	2757	1422	3567	2	A-4	GRND	852	3	0
43	6199-6	07/18/86	11	TYNDALL	1441	5543	1516	0403	35	F-16	YUCC	855	22	19
44	6199-6	07/18/86	11	TYNDALL	1441	5543	1516	0403	32	F-15	YUCC	877	3	0
45	6199-6	07/18/86	11	TYNDALL	1441	5543	1516	0403	32	F-15	YUCC	880	47	44
46	6199-4	07/18/86	11	TYNDALL	1304	3375	1327	4205	32	F-15	LANC	927	3	0
47	6199-4	07/18/86	11	TYNDALL	1304	3375	1327	4205	35	F-16	LANC	930	3	0
48	6220-1	08/08/86	11	TYNDALL	0853	0299	0928	0289	35	F-16	RACO	933	3	0
49	6220-1	08/08/86	11	TYNDALL	0853	0299	0928	0289	35	F-16	RACO	936	3	0
50	6220-1	08/08/86	11	TYNDALL	0853	0299	0928	0289	32	F-15	RACO	939	3	0
51	6219-7	08/05/86	11	TYNDALL	1433	5023	1502	5795	35	F-16	GRIF	942	3	0
52	6219-7	08/05/86	11	TYNDALL	1433	5023	1502	5795	35	F-16	GRIF	945	3	0
53	6219-7	08/05/86	11	TYNDALL	1433	5023	1502	5795	36	F-16	WHAM	948	8	5
54	6219-7	08/05/86	11	TYNDALL	1433	5023	1502	5795	36	F-16	WHAM	956	3	0

Table A-3. Data written to the INDEX File.

INDEX FILE TO LIBRARY TAPE
FULL INDEX: 86/08/21.
03.22.49.
SUPERSONIC DATA ONLY

ENTRY NO	MISSION NAME	MISSION DATE	SITE NO	LOCATION	STARTING TIME HR M SEC	FINISHING TIME HR M SEC	A/C TYPE		A/C TAIL NO	STARTING RECORD NO	NO OF RECORDS	NO OF SUPERSONIC RECORDS
1	6074-1	03/17/86	11	TYNDALL	0743 1463	0743 1773	35	F-16	LANC	2	3	0
2	6074-1	03/17/86	11	TYNDALL	0743 1923	0759 3633	32	F-15	LANC	5	3	0
3	6074-1	03/17/86	11	TYNDALL	0743 1463	0743 1773	35	F-16	LANC	8	3	0
4	6074-1	03/17/86	11	TYNDALL	0743 1923	0759 3633	35	F-16	LANC	11	3	0
5	6074-1	03/17/86	11	TYNDALL	0743 1463	0743 1773	35	F-16	LANC	14	3	0
6	6074-1	03/17/86	11	TYNDALL	0743 1923	0759 3633	35	F-16	LANC	17	3	0
7	6074-1	03/17/86	11	TYNDALL	0743 1463	0743 1773	35	F-16	LANC	20	3	0
8	6074-1	03/17/86	11	TYNDALL	0743 1923	0759 3633	35	F-16	LANC	23	3	0
9	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	32	F-15	LANC	26	3	0
10	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	35	F-16	LANC	29	10	7
11	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	35	F-16	LANC	39	17	14
12	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	35	F-16	LANC	56	4	1
13	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	35	F-16	LANC	60	3	0
14	6169-6	05/18/86	11	TYNDALL	1117 5651	1146 4411	16	F-4	CMBT	63	3	0
15	6169-6	05/18/86	11	TYNDALL	1117 5651	1146 4411	19	F-4	CMBT	66	11	8
16	6169-6	05/18/86	11	TYNDALL	1353 6243	1429 3623	35	F-16	GRIF	77	5	2
17	6169-8	05/18/86	11	TYNDALL	1353 6243	1429 3323	32	F-15	GRIF	82	84	81
18	6169-8	05/18/86	11	TYNDALL	1353 6243	1429 3823	35	F-16	GPUD	166	7	4
19	6169-8	05/18/86	11	TYNDALL	1353 6243	1429 3823	32	F-15	GPUD	173	3	0
20	6169-7	05/18/86	11	TYNDALL	1307 5919	1339 0993	32	F-15	LANC	176	3	0
21	6169-7	05/18/86	11	TYNDALL	1307 5919	1339 0993	35	F-16	LANC	179	3	0
22	6169-7	05/18/86	11	TYNDALL	1307 5919	1339 0993	32	F-15	LANC	182	3	0
23	6169-7	05/18/86	11	TYNDALL	1307 5919	1339 0993	32	F-15	LANC	185	3	0
24	6170-7	05/19/86	11	TYNDALL	1221 2169	1259 2223	32	F-15	CUBI	188	3	0
25	6170-7	05/19/86	11	TYNDALL	1221 2169	1259 2223	35	F-16	CUBI	191	3	0
26	6170-7	05/19/86	11	TYNDALL	1221 2169	1259 2223	16	F-4	CMBT	194	3	0
27	6170-7	05/19/86	11	TYNDALL	1221 2169	1259 2223	16	F-4	CMBT	197	21	18
28	6170-1	05/19/86	11	TYNDALL	0743 3003	0818 2453	35	F-16	YUKO	218	89	86
29	6170-1	05/19/86	11	TYNDALL	0743 3003	0818 2453	32	F-15	YUKO	307	146	143
30	6170-1	05/19/86	11	TYNDALL	0743 3003	0818 2453	16	F-4	CMBT	453	37	34
31	6170-1	05/19/86	11	TYNDALL	0743 3003	0818 2453	19	F-4	CMBT	490	7	4
32	6193-3	07/18/86	11	TYNDALL	0927 1303	1000 2263	35	F-16	SPIK	497	221	218
33	6193-3	07/18/86	11	TYNDALL	0927 1303	1000 2263	32	F-15	SPIK	718	52	49
34	6193-3	07/18/86	11	TYNDALL	0927 1303	1000 2263	4	A-4	SPIK	770	3	0
35	6199-5	07/18/86	11	TYNDALL	1350 3557	1356 2627	32	F-15	AUDI	773	3	0
36	6199-5	07/18/86	11	TYNDALL	1356 2757	1422 3867	35	F-16	AUDI	776	47	44
37	6199-5	07/18/86	11	TYNDALL	1350 3557	1356 2627	32	F-15	GRND	823	3	0
38	6199-5	07/18/86	11	TYNDALL	1356 2757	1422 3567	32	F-15	GRND	826	17	14
39	6199-5	07/18/86	11	TYNDALL	1350 3557	1356 2627	4	A-4	AUDI	843	3	0
40	6199-5	07/18/86	11	TYNDALL	1356 2757	1422 3567	4	A-4	AUDI	846	3	0
41	6199-5	07/18/86	11	TYNDALL	1350 3557	1356 2627	2	A-4	GRND	849	3	0
42	6199-5	07/18/86	11	TYNDALL	1356 2757	1422 3567	2	A-4	GRND	852	3	0
43	6199-6	07/18/86	11	TYNDALL	1441 5543	1516 0403	35	F-16	YUCC	855	22	19
44	6199-6	07/18/86	11	TYNDALL	1441 5543	1516 0403	32	F-15	YUCC	877	3	0
45	6199-6	07/18/86	11	TYNDALL	1441 5543	1516 0403	32	F-15	YUCC	880	47	44
46	6199-4	07/18/86	11	TYNDALL	1304 3075	1327 4205	32	F-15	LANC	927	3	0
47	6199-4	07/18/86	11	TYNDALL	1304 3075	1327 4205	35	F-16	LANC	930	3	0
48	6220-1	08/05/86	11	TYNDALL	0853 0239	0928 0283	33	F-16	RACO	933	3	0
49	6220-1	08/05/86	11	TYNDALL	0853 0239	0928 0283	35	F-16	RACO	936	3	0
50	6220-1	08/05/86	11	TYNDALL	0853 0239	0928 0289	32	F-15	RACO	939	3	0
51	6218-7	08/06/86	11	TYNDALL	1433 5023	1502 5795	35	F-16	GRIF	942	3	0
52	6218-7	08/06/86	11	TYNDALL	1433 5023	1502 5795	35	F-16	GRIF	945	3	0
53	6218-7	08/06/86	11	TYNDALL	1433 5023	1502 5795	36	F-16	WHAN	948	8	5
54	6218-7	08/06/86	11	TYNDALL	1433 5023	1502 5795	36	F-16	WHAN	956	3	0

Table A-3. Data written to the INDEX File.

```
*************************
*  MISSION INDEX FILE   *
*  UPDATED:  86/08/21.  *
*            09.22.50.  *
* SUPERSONIC DATA ONLY  *
*************************
```

MISSION NAME	MISSION DATE	SITE LOCATION
6074-1	03/17/86	TYNDALL
6073-9	03/14/86	TYNDALL
6169-6	06/18/86	TYNDALL
6169-8	06/18/86	TYNDALL
6169-7	06/18/86	TYNDALL
6170-7	06/19/86	TYNDALL
6170-1	06/19/86	TYNDALL
6199-3	07/18/86	TYNDALL
6199-5	07/18/86	TYNDALL
6199-6	07/18/86	TYNDALL
6199-4	07/18/86	TYNDALL
6220-1	08/08/86	TYNDALL
6218-7	08/06/86	TYNDALL

NUMBER OF MISSION TAPES ANALYZED = 13

Table A-4. Data Written to the MINDEX File.

```
********************************
*  INDEX FILE TO LIBRARY TAPE  *
*     FULL INDEX: 86/10/13     *
*               15:14:30       *
*    SUPERSONIC DATA ONLY      *
********************************
```

ENTRY NO	MISSION NAME	MISSION DATE	SITE NO	LOCATION	STARTING TIME HR M SEC	FINISHING TIME HR M SEC	A/C TYPE	A/C TAIL NO	STARTING RECORD NO	NO OF RECORDS	NO OF SUPERSONIC RECORDS
1	6100702-5ROD	11/16/69	7	HOLLOMAN	0853 4555	0921 1205	22 F-15	137	2	27	24
2	6100702-5ROD	11/16/69	7	HOLLOMAN	0853 4555	0921 1205	22 F-15	101	29	102	99
3	6100702-5ROD	11/16/69	7	HOLLOMAN	0853 4555	0921 1205	39 F-15	100	131	211	208
4	6100702-5ROD	11/16/69	7	HOLLOMAN	0853 4555	0921 1205	39 F-15	121	342	106	103
5	6107803-6/SN	04/17/86	7	HOLLOMAN	1007 0101	1051 0141	22 F-15	150	448	214	211
6	6107803-6/SN	04/17/86	7	HOLLOMAN	1007 0101	1051 0141	22 F-15	124	662	234	231
7	6107803-6/SN	04/17/86	7	HOLLOMAN	1007 0101	1051 0141	22 F-15	117	896	96	93
8	6107803-6/SN	04/17/86	7	HOLLOMAN	1007 0101	1051 0141	22 F-15	145	992	89	86
9	6107701-4/RO	04/17/86	7	HOLLOMAN	1437 0415	1517 3565	21 F-15	096	1081	69	66
10	6107701-4/RO	04/17/86	7	HOLLOMAN	1437 0415	1517 3565	22 F-15	121	1150	163	160
11	6107701-4/RO	04/17/86	7	HOLLOMAN	1437 0415	1517 3565	22 F-15	133	1313	174	171
12	6107701-4/RO	04/17/86	7	HOLLOMAN	1437 0415	1517 3565	22 F-15	101	1487	182	179
13	6007801-4/CO	03/28/86	7	HOLLOMAN	0709 2349	0751 3449	22 F-15	145	1669	60	57
14	6007801-4/CO	03/28/86	7	HOLLOMAN	0709 2349	0751 3449	22 F-15	086	1729	52	49
15	6007801-4/CO	03/28/86	7	HOLLOMAN	0709 2349	0751 3449	22 F-15	116	1781	162	159
16	6007801-4/CO	03/28/86	7	HOLLOMAN	0709 2349	0751 3449	22 F-15	124	1943	138	135
17	5202805-8PAL	10/09/85	7	HOLLOMAN	1324 1051	1358 2351	22 F-15	067	2081	45	42
18	5202805-8PAL	10/09/85	7	HOLLOMAN	1324 1051	1358 2351	22 F-15	135	2126	86	83
19	5202805-8PAL	10/09/85	7	HOLLOMAN	1324 1051	1358 2351	22 F-15	115	2212	37	34
20	5202805-8PAL	10/09/85	7	HOLLOMAN	1324 1051	1358 2351	22 F-15	116	2249	39	36
21	5204711-14DA	10/11/85	7	HOLLOMAN	1145 0627	1223 3077	21 F-15	096	2288	88	85
22	5204711-14DA	10/11/85	7	HOLLOMAN	1145 0627	1223 3077	39 F-4	132	2376	55	52
23	5204711-14DA	10/11/85	7	HOLLOMAN	1145 0627	1223 3077	30 F-4	146	2431	107	104
24	5204711-14DA	10/11/85	7	HOLLOMAN	1145 0627	1223 3077	21 F-15	100	2538	35	32
25	5202723-26RO	10/09/85	7	HOLLOMAN	1533 2373	1605 4623	22 F-15	133	2573	176	173
26	5202723-26RO	10/09/85	7	HOLLOMAN	1533 2373	1605 4623	22 F-15	140	2749	90	87
27	5202723-26RO	10/09/85	7	HOLLOMAN	1533 2373	1605 4623	21 F-15	112	2839	33	30
28	5202723-26RO	10/09/85	7	HOLLOMAN	1533 2373	1605 4623	21 F-15	100	2872	48	45
29	5200721-24	10/07/85	7	HOLLOMAN	1544 0529	1600 0029	21 F-15	097	2920	3	0
30	5200721-24	10/07/85	7	HOLLOMAN	1544 0529	1600 0029	21 F-15	099	2923	53	50
31	5200721-24	10/07/85	7	HOLLOMAN	1544 0529	1600 0029	22 F-15	131	2976	168	165
32	5200721-24	10/07/85	7	HOLLOMAN	1544 0529	1600 0029	22 F-15	119	3144	208	205
33	5202717-20GI	10/09/85	7	HOLLOMAN	1247 3511	1321 4519	22 F-15	131	3432	13	10
34	5202717-20GI	10/09/85	7	HOLLOMAN	1247 3511	1321 4519	21 F-15	101	3445	43	40
35	5202717-20GI	10/09/85	7	HOLLOMAN	1247 3511	1321 4519	21 F-15	134	3488	91	88
36	5202717-20GI	10/09/85	7	HOLLOMAN	1247 3511	1321 4519	22 F-15	121	3579	95	92

Table A-5. Full INDEX File for Holloman MOA.

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**************************
*  MISSION INDEX FILE    *
*  UPDATED: 86/10/13     *
*           15:14:30     *
* SUPERSONIC DATA ONLY   *
**************************
```

MISSION NAME	MISSION DATE	SITE LOCATION
6100702-5ROD	6/69	HOLLOMAN
6107803-6/SN	7/86	HOLLOMAN
6107701-4/RO	7/86	HOLLOMAN
6087801-4/CO	8/86	HOLLOMAN
5282805-8PAL	9/85	HOLLOMAN
5284711-14DA	1/85	HOLLOMAN
5282723-26RO	9/85	HOLLOMAN
5280721-24	7/85	HOLLOMAN
5282717-20GI	9/85	HOLLOMAN

NUMBER OF MISSION TAPES ANALYZED = 9

Table A-6. Mission Index File for Holloman MOA.

INDEX FILE TO LIBRARY TAPE
FULL INDEX: 86/10/13
15:20:12
SUPERSONIC DATA ONLY

ENTRY NO	MISSION NAME	MISSION DATE	SITE NO	LOCATION	STARTING TIME HR M SEC	FINISHING TIME HR M SEC	A/C TYPE	A/C TAIL NO	STARTING RECORD NO	NO OF RECORDS	NO OF SUPERSONIC RECORDS
1	6063-11	03/04/86	5	LUKE	1236 0385	1252 5105	28 F-16	001	2	84	81
2	6063-11	03/04/86	5	LUKE	1236 0385	1252 5105	28 F-16	002	86	53	50
3	6063-11	03/04/86	5	LUKE	1236 0385	1252 5105	46	01	139	3	0
4	6063-11	03/04/86	5	LUKE	1236 0385	1252 5105	47	02	142	3	0
5	6063-11	03/04/86	5	LUKE	1236 0385	1252 5105	7 F-14	03	145	33	30
6	6063-11	03/04/86	5	LUKE	1236 0385	1252 5105	7 F-14	04	178	37	34
7	6062-11	03/03/86	5	LUKE	1150 1453	1223 1293	28 F-16	330	215	3	0
8	6062-11	03/03/86	5	LUKE	1150 1453	1223 1293	28 F-16	311	218	231	228
9	6062-11	03/03/86	5	LUKE	1150 1453	1223 1293	47	100	449	19	16
10	6062-11	03/03/86	5	LUKE	1150 1453	1223 1293	47	113	468	8	5
11	6063-4	03/04/86	5	LUKE	0835 4773	0857 3023	22 F-15	5067	476	48	45
12	6063-4	03/04/86	5	LUKE	0835 4773	0857 3023	22 F-15	5049	524	37	34
13	6063-4	03/04/86	5	LUKE	0835 4773	0857 3023	32 F-18	303	561	20	17
14	6063-4	03/04/86	5	LUKE	0835 4773	0857 3023	32 F-18	304	581	57	54
15	6062-8	03/03/86	5	LUKE	1028 5497	1055 5107	38 F-15	7164	638	125	122
16	6062-8	03/03/86	5	LUKE	1028 5497	1055 5107	22 F-15	6102	763	3	0
17	6062-8	03/03/86	5	LUKE	1028 5497	1055 5107	32 F-18	302	766	3	0
18	6062-8	03/03/86	5	LUKE	1028 5497	1055 5107	32 F-18	300	769	43	40
19	5196-18	07/15/85	5	LUKE	1528 5899	1530 4059	22 F-15	7163	812	4	1
20	5196-18	07/15/85	5	LUKE	1530 4069	1557 1441	22 F-15	7163	816	52	49
21	5196-18	07/15/85	5	LUKE	1528 5899	1530 4059	0	5049	868	3	0
22	5196-18	07/15/85	5	LUKE	1530 4069	1557 1441	22 F-15	5049	871	72	69
23	5196-18	07/15/85	5	LUKE	1528 5899	1530 4059	15 A-7	406	943	3	0
24	5196-18	07/15/85	5	LUKE	1530 4069	1557 1441	15 A-7	406	946	3	0
25	5196-18	07/15/85	5	LUKE	1528 5899	1530 4059	15 A-7	210	949	3	0
26	5196-18	07/15/85	5	LUKE	1530 4069	1557 1441	15 A-7	210	952	3	0
27	5203-15	07/22/85	5	LUKE	1356 4435	1428 1971	28 F-16	118	955	50	47
28	5203-15	07/22/85	5	LUKE	1356 4435	1428 1971	28 F-16	124	1005	143	140
29	5203-15	07/22/[illegible]	[illegible]	LUKE	1356 4435	1428 1971	40 F-4	6555	1148	169	166
30	5203-15	07/22/85	5	LUKE	1356 4435	1428 1971	40 F-4	519	1317	139	136
31	5203-15	07/22/85	5	LUKE	1356 4435	1428 1971	40 F-4	432	1456	181	178
32	5203-15	07/22/85	5	LUKE	1356 4435	1428 1971	40 F-4	677	1637	91	88
33	5197-5-DACT	07/16/85	5	LUKE	0854 0247	0933 1957	22 F-15	5047	1728	115	112
34	5197-5-DACT	07/16/85	5	LUKE	0854 0247	0933 1957	22 F-15	1063	1843	118	115
35	5197-5-DACT	07/16/85	5	LUKE	0854 0247	0933 1957	28 F-16	124	1961	106	103
36	5197-5-DACT	07/16/85	5	LUKE	0854 0247	0933 1957	28 F-16	118	2067	25	22
37	5203-5-DACT	07/22/85	5	LUKE	0859 2793	0827 2793	22 F-15	5049	2092	3	0
38	5203-5-DACT	07/22/85	5	LUKE	0827 2793	0859 2793	22 F-15	5--)	2095	3	0
39	5203-5-DACT	07/22/85	5	LUKE	0859 2793	0934 4003	22 F-15	5049	2098	40	37
40	5203-5-DACT	07/22/85	5	LUKE	0859 2793	0827 2793	28 F-[illegible]	124	2138	3	0
41	5203-5-DACT	07/22/85	5	LUKE	0827 2793	0059 2793	28 F-16	1	2141	3	0
42	5203-5-DACT	07/22/85	5	LUKE	0859 2793	0934 4003	28 F-16	124	2144	47	44
43	5203-5-DACT	07/22/85	5	LUKE	0859 2793	0827 2793	28 F-16	118	2191	3	0
44	5203-5-DACT	07/22/85	5	LUKE	0827 2793	0859 2793	28 F-16	1	2194	3	0
45	5203-5-DACT	07/22/85	5	LUKE	0859 2793	0934 4003	20 F-16	118	2197	102	99

Table A-7. Full INDEX File for Luke MOA.

```
************************
*  MISSION INDEX FILE   *
*  UPDATED: 86/10/13    *
*           15:20:12    *
* SUPERSONIC DATA ONLY  *
************************
```

MISSION NAME	MISSION DATE	SITE LOCATION
6063-11	4/86	LUKE
6062-11	3/86	LUKE
6063-4	4/86	LUKE
6062-8	3/86	LUKE
5196-18	5/85	LUKE
5203-15	2/85	LUKE
5197-5-DACT	6/85	LUKE
5203-5-DACT	2/85	LUKE

NUMBER OF MISSION TAPES ANALYZED = 8

Table A-8. Mission INDEX File for Luke MOA.

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**********************************
*  INDEX FILE TO LIBRARY TAPE    *
*     FULL INDEX: 86/10/13       *
*                 15:46:40       *
*     SUPERSONIC DATA ONLY       *
**********************************
```

ENTRY NO	MISSION NAME	MISSION DATE	SITE NO	LOCATION	STARTING TIME HR M SEC	FINISHING TIME HR M SEC	A/C TYPE	A/C TAIL NO	STARTING RECORD NO	NO OF RECORDS	NO OF SUPERSONIC RECORDS
1	6024-DACT-1130	01/24/86	1	NELLIS	1128 4349	1147 5809	9 F-5	MIG	2	3	0
2	6024-DACT-1130	01/24/86	1	NELLIS	1128 4349	1147 5809	9 F-5	MIG	5	3	0
3	6024-DACT-1130	01/24/86	1	NELLIS	1128 4349	1147 5809	21 F-15	RING	8	3	0
4	6024-DACT-1130	01/24/86	1	NELLIS	1128 4349	1147 5809	21 F-15	RING	11	3	0
5	6006-DACT-0830	01/06/86	1	NELLIS	0833 4315	0857 4145	9 F-5	MIG	14	20	17
6	6006-DACT-0830	01/06/86	1	NELLIS	0833 4315	0857 4145	9 F-5	MIG	34	35	32
7	6006-DACT-0830	01/06/86	1	NELLIS	0833 4315	0857 4145	28 F-106	COBR	69	3	0
8	6006-DACT-0830	01/06/86	1	NELLIS	0833 4315	0857 4145	29 F-106	COBR	72	3	0
9	6170-DACT-1230	06/19/86	1	NELLIS	1236 4061	1259 0001	9 F-5	MIG	75	14	11
10	6170-DACT-1230	06/19/86	1	NELLIS	1236 4061	1259 0001	9 F-5	MIG	89	3	0
11	6170-DACT-1230	06/19/86	1	NELLIS	1236 4061	1259 0001	29 F-106	WOLF	92	3	0
12	6170-DACT-1230	06/19/86	1	NELLIS	1236 4061	1259 0001	29 F-106	WOLF	95	3	0
13	6170-DACT-1200	06/19/86	1	NELLIS	1201 2683	1230 1473	9 F-5	MIG	98	69	66
14	6170-DACT-1200	06/19/86	1	NELLIS	1201 2683	1230 1473	9 F-5	MIG	167	17	14
15	6170-DACT-1200	06/19/86	1	NELLIS	1201 2683	1230 1473	29 F-106	SNAK	184	11	8
16	6170-DACT-1200	06/19/86	1	NELLIS	1201 2683	1230 1473	29 F-106	SNAK	195	47	44

Table A-9. Full INDEX File for Nellis MOA.

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*************************
*  MISSION INDEX FILE   *
*  UPDATED: 86/10/13    *
*           15:46:40    *
* SUPERSONIC DATA ONLY  *
*************************
```

MISSION NAME	MISSION DATE	SITE LOCATION
6024-DACT-1130	4/86	NELLIS
6006-DACT-0830	6/86	NELLIS
6170-DACT-1230	9/86	NELLIS
6170-DACT-1200	9/86	NELLIS

NUMBER OF MISSION TAPES ANALYZED = 4

Table A-10. Mission INDEX File for Nellis MOA.

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*********************************
*  INDEX FILE TO LIBRARY TAPE  *
*     FULL INDEX: 86/10/13      *
*                 15:45:05      *
*     SUPERSONIC DATA ONLY      *
*********************************
```

ENTRY NO	MISSION NAME	MISSION DATE	SITE NO	LOCATION	STARTING TIME HR M SEC	FINISHING TIME HR M SEC	A/C TYPE	A/C TAIL NO	STARTING RECORD NO	NO OF RECORDS	NO OF SUPERSONIC RECORDS
1	LAA603120639	03/12/86	3	OCEANA	0919 5436	0947 2212	39 F-4	94TH	2	13	10
2	LAA603120639	03/12/86	3	OCEANA	0919 5436	0947 2212	36 F-14	94TH	15	67	64
3	LAA603120639	03/12/86	3	OCEANA	0919 5436	0947 2212	59	VF-4	82	21	18
4	LAA603120639	03/12/86	3	OCEANA	0919 5436	0947 2212	58	VF-4	103	46	43
5	LAA603120639	03/12/86	3	OCEANA	0919 5436	0947 2212	59	VF-4	149	55	52
6	LAA603100619	03/10/86	3	OCEANA	1039 5975	1121 5513	39 F-4	71ST	204	257	254
7	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	36 F-14	94TH	461	3	0
8	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	36 F-14	94TH	464	3	0
9	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	39 F-4	94TH	467	3	0
10	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	36 F-14	94TH	470	3	0
11	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	59	VF-4	473	3	0
12	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	59	VF-4	476	52	49
13	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	59	VF-4	528	3	0
14	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	59	VF-4	531	7	4
15	LAA603110630	03/11/86	3	OCEANA	0914 1392	0918 2065	59	VF-4	538	3	0
16	LAA603110630	03/11/86	3	OCEANA	0918 2095	0944 4429	59	VF-4	541	4	1

Table A-11. Full INDEX File for Oceana MOA.

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*************************
*  MISSION INDEX FILE   *
*  UPDATED: 86/10/13    *
*           15:45:05    *
* SUPERSONIC DATA ONLY  *
*************************
```

MISSION NAME	MISSION DATE	SITE LOCATION
LAA603120639	2/86	OCEANA
LAA603100619	0/86	OCEANA
LAA603110630	1/86	OCEANA

NUMBER OF MISSION TAPES ANALYZED = 3

Table A-12. Mission INDEX File for Oceana MOA.

INDEX FILE TO LIBRARY TAPE
FULL INDEX: 86/10/13
15:47:00
SUPERSONIC DATA ONLY

ENTRY NO	MISSION NAME	MISSION DATE	SITE NO	LOCATION	STARTING TIME HR M SEC	FINISHING TIME HR M SEC	A/C TYPE	A/C TAIL NO	STARTING RECORD NO	NO OF RECORDS	NO OF SUPERSONIC RECORDS
1	6074-1	03/17/86	11	TYNDALL	0740 1463	0743 1773	35 F-16	LANC	2	3	0
2	6074-1	03/17/86	11	TYNDALL	0743 1923	0759 3633	32 F-15	LANC	5	3	0
3	6074-1	03/17/06	11	TYNDALL	0740 1463	0743 1773	35 F-16	LANC	8	3	0
4	6074-1	03/17/86	11	TYNDALL	0743 1923	0759 3633	35 F-16	LANC	11	3	0
5	6074-1	03/17/86	11	TYNDALL	0740 1463	0743 1773	35 F-16	LANC	14	3	0
6	6074-1	03/17/66	11	TYNDALL	0743 1923	0759 3633	35 F-16	LANC	17	3	0
7	6074-1	03/17/86	11	TYNDALL	0740 1463	0743 1773	35 F-16	LANC	20	3	0
8	6074-1	03/17/86	11	TYNDALL	0743 1923	0759 3633	35 F-16	LANC	23	3	0
9	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	32 F-15	LANC	26	3	0
10	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	35 F-16	LANC	29	10	7
11	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	35 F-16	LANC	39	17	14
12	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	35 F-16	LANC	56	4	1
13	6073-9	03/14/86	11	TYNDALL	1522 4613	1549 4333	35 F-16	LANC	60	3	0
14	6169-6	06/18/86	11	TYNDALL	1117 5651	1146 4411	16 F-4	CMBT	63	3	0
15	6169-6	06/18/86	11	TYNDALL	1117 5651	1146 4411	19 F-4	CMBT	66	11	8
16	6169-8	06/18/86	11	TYNDALL	1353 0243	1429 3823	35 F-16	GRIF	77	5	2
17	6169-8	06/18/86	11	TYNDALL	1353 0243	1429 3823	32 F-15	GRIF	82	84	81
18	6169-8	06/18/86	11	TYNDALL	1353 0243	1429 3823	35 F-16	GRUD	166	7	4
19	6169-8	06/18/86	11	TYNDALL	1353 0243	1429 3823	32 F-15	GRUD	173	3	0
20	6169-7	06/18/86	11	TYNDALL	1307 5919	1339 0999	32 F-15	LANC	176	3	0
21	6169-7	06/18/86	11	TYNDALL	1307 5919	1339 0999	35 F-16	LANC	179	3	0
22	6169-7	06/18/86	11	TYNDALL	1307 5919	1339 0999	32 F-15	LANC	182	3	0
23	6169-7	06/18/86	11	TYNDALL	1307 5919	1339 0999	32 F-15	LANC	185	3	0
24	6170-7	06/19/86	11	TYNDALL	1221 2169	1259 2229	32 F-15	CUBI	188	3	0
25	6170-7	06/19/86	11	TYNDALL	1221 2169	1259 2229	35 F-16	CUBI	191	3	0
26	6170-7	06/19/86	11	TYNDALL	1221 2169	1259 2229	16 F-4	CMBT	194	3	0
27	6170-7	06/19/86	11	TYNDALL	1221 2169	1259 2229	16 F-4	CMBT	197	21	18
28	6170-1	06/19/86	11	TYNDALL	0748 3003	0818 2453	35 F-16	YUKO	218	89	86
29	6170-1	06/19/86	11	TYNDALL	0748 3003	0818 2453	32 F-15	YUKO	307	146	143
30	6170-1	06/19/86	11	TYNDALL	0748 3003	0818 2453	16 F-4	CMBT	453	37	34
31	6170-1	06/19/86	11	TYNDALL	0748 3003	0818 2453	19 F-4	CMBT	490	7	4
32	6199-3	07/18/86	11	TYNDALL	0927 1303	1000 2203	35 F-16	SPIK	497	221	218
33	6199-3	07/18/86	11	TYNDALL	0927 1303	1000 2203	32 F-15	SPIK	718	52	49
34	6199-3	07/18/86	11	TYNDALL	0927 1303	1000 2203	4 A-4	SPIK	770	3	0
35	6199-5	07/18/86	11	TYNDALL	1350 3557	1356 2627	32 F-15	AUDI	773	3	0
36	6199-5	07/18/86	11	TYNDALL	1356 2757	1422 3867	35 F-16	AUDI	776	47	44
37	6199-5	07/18/86	11	TYNDALL	1350 3557	1356 2627	32 F-15	GRND	823	3	0
38	6199-5	07/18/86	11	TYNDALL	1356 2757	1422 3867	32 F-15	GRND	826	17	14
39	6199-5	07/18/86	11	TYNDALL	1350 3557	1356 2627	4 A-4	AUDI	843	3	0
40	6199-5	07/18/86	11	TYNDALL	1356 2757	1422 3867	4 A-4	AUDI	846	3	0
41	6199-5	07/18/86	11	TYNDALL	1350 3557	1356 2627	2 A-4	GRND	849	3	0
42	6199-5	07/18/86	11	TYNDALL	1356 2757	1422 3867	2 A-4	GRND	852	3	0
43	6199-6	07/18/86	11	TYNDALL	1441 5543	1516 0403	35 F-16	YUCC	855	22	19
44	6199-6	07/18/86	11	TYNDALL	1441 5543	1516 0403	32 F-15	YUCC	877	3	0
45	6199-6	07/18/86	11	TYNDALL	1441 5543	1516 0403	32 F-15	YUCC	880	47	44
46	6199-4	07/18/86	11	TYNDALL	1304 3075	1327 4205	32 F-15	LANC	927	3	0
47	6199-4	07/18/86	11	TYNDALL	1304 3075	1327 4205	35 F-16	LANC	930	3	0
48	6220-1	08/08/86	11	TYNDALL	0858 0299	0928 0289	35 F-16	BACO	933	3	0
49	6220-1	08/08/86	11	TYNDALL	0858 0299	0928 0289	35 F-16	BACO	936	3	0
50	6220-1	08/08/86	11	TYNDALL	0858 0299	0928 0289	32 F-15	BACO	939	3	0
51	6218-7	08/06/86	11	TYNDALL	1433 5023	1502 5795	35 F-16	GRIF	942	3	0
52	6218-7	08/06/86	11	TYNDALL	1433 5023	1502 5795	35 F-16	GRIF	945	3	0
53	6218-7	08/06/86	11	TYNDALL	1433 5023	1502 5795	36 F-16	WHAM	948	8	5
54	6218-7	08/06/86	11	TYNDALL	1433 5023	1502 5795	36 F-16	WHAM	956	3	0
55	6219-3	08/07/06	11	TYNDALL	1001 1855	1020 3615	35 F-16	INDE	959	13	10
56	6219-3	08/07/86	11	TYNDALL	1001 1855	1020 3615	32 F-15	INDE	972	14	11
57	6223-1	08/11/86	11	TYNDALL	0755 0737	0826 1507	35 F-16	TANK	986	111	108
58	6223-1	08/11/86	11	TYNDALL	0755 0737	0826 1507	35 F-16	TANK	1097	99	96
59	6223-1	08/11/06	11	TYNDALL	0755 0737	0826 1507	36 F-16	KARA	1196	84	81
60	6223-1	08/11/86	11	TYNDALL	0755 0737	0826 1507	36 F-16	KARA	1280	65	62

Table A-13. Full INDEX File for Tyndall MOA.

```
*************************
*  MISSION INDEX FILE   *
*  UPDATED: 86/10/13    *
*           15:47:00    *
* SUPERSONIC DATA ONLY  *
*************************
```

MISSION NAME	MISSION DATE	SITE LOCATION
6074-1	7/86	TYNDALL
6073-9	4/86	TYNDALL
6169-6	8/86	TYNDALL
6169-8	8/86	TYNDALL
6169-7	8/86	TYNDALL
6170-7	9/86	TYNDALL
6170-1	9/86	TYNDALL
6199-3	8/86	TYNDALL
6199-5	8/86	TYNDALL
6199-6	8/86	TYNDALL
6199-4	8/86	TYNDALL
6220-1	8/86	TYNDALL
6218-7	6/86	TYNDALL
6219-3	7/86	TYNDALL
6223-1	1/86	TYNDALL

NUMBER OF MISSION TAPES ANALYZED = 15

Table A-14. Mission INDEX File for Tyndall MOA.

APPENDIX B

BOOM-MAP PROGRAM OUTPUT EXAMPLES

NOTE: ALL PLOTS HAVE BEEN REDUCED AND THE SCALE IS INCORRECT

SOURCE LISTING:

```
TITLE  TYNDALL MOA - ALL MISSIONS AS OF 9/03/86

SITE  TYNDALL
MISSION  6073-9,6170-7,6199-5,6199-6,6199-4,6216-7,6219-3,6223-1
TIME  ALL
AIRCRAFT    F-4,F-15,F-16

MACHTRK  300000
BOOMTRK  300000
CONTOUR  CSEL,   300000, 95, 100, 105
CONTOUR  PKOP,   300000, 0.6, 0.3, 1.0, 2.0
CONTOUR  CLDN,   300000,-45,-55,-65,-75
WIDTH 36.0
STAT
```

TABLE: 1/ 1

SITE LOCATION	EXRECISE NAME	DATE (YYMMDD-YYMMDD)	TIME (HHMM-HHMM)	AIRCRAFT TYPE	TAIL NUMBER	#
TYNDALL	6073-9	ALL	ALL	F-4	ALL	1
	6170-7			F-15		2
	6199-5			F-16		3
	6199-6					4
	6199-4					5
	6216-7					6
	6219-3					7
	6223-1					8

Table B-1. Page 1 of BOOM-MAP Output.

TITLE: TYNDALL MOA - ALL MISSIONS AS OF 9/33/86

NO	MISSION NAME	MISSION DATE	SITE LOCATION	STARTING TIME HR-MN-SECS	FINISHING TIME HR-MN-SECS	A/C TYPE	A/C TAIL NO	SUPERSONIC TIME (SEC)	BOOM TIME (SEC)
1	6073-9	03/14/86	TYNDALL	15:22:46.13	15:49:43.33	F-15	LANC	.0	.0
2	6073-9	03/14/86	TYNDALL	15:22:46.13	15:49:43.33	F-16	LANC	10.0	.0
3	6073-9	03/14/86	TYNDALL	15:22:46.13	15:49:43.33	F-16	LANC	14.0	.0
4	6073-9	03/14/86	TYNDALL	15:22:46.13	15:49:43.33	F-16	LANC	.0	.0
5	6073-9	03/14/86	TYNDALL	15:22:46.13	15:49:43.33	F-16	LANC	.0	.0
6	6170-7	06/19/86	TYNDALL	12:21:21.69	12:59:22.29	F-15	CUBI	.0	.0
7	6170-7	06/19/86	TYNDALL	12:21:21.69	12:59:22.29	F-16	CUBI	.0	.0
8	6170-7	06/19/86	TYNDALL	12:21:21.69	12:59:22.29	F-4	CMBT	.0	.0
9	6170-7	06/19/86	TYNDALL	12:21:21.69	12:59:22.29	F-4	CMBT	13.0	.0
10	6193-5	07/18/86	TYNDALL	13:50:35.57	13:56:26.27	F-15	AUDI	.0	.0
11	6193-5	07/18/86	TYNDALL	13:56:27.57	14:22:38.67	F-16	AUDI	48.0	5.0
12	6193-5	07/18/86	TYNDALL	13:50:35.57	13:55:26.27	F-15	GRNO	.0	.0
13	6193-5	07/18/86	TYNDALL	13:56:27.57	14:22:38.67	F-15	GRNC	9.0	.0
14	6195-6	07/18/86	TYNDALL	14:41:55.43	15:16:04.03	F-16	YUCC	20.0	.0
15	6195-6	07/18/86	TYNDALL	14:41:55.43	15:16:04.03	F-15	YUCC	.0	.0
16	6196-6	07/18/86	TYNDALL	14:41:55.43	15:16:04.03	F-15	YUCC	61.0	.0
17	6193-4	07/18/86	TYNDALL	13:04:30.75	13:27:42.05	F-15	LANC	.0	.0
18	6199-4	07/18/86	TYNDALL	13:04:30.75	13:27:42.05	F-16	LANC	.0	.0
19	6218-7	08/06/86	TYNDALL	14:33:50.23	15:02:57.95	F-16	GRIF	.0	.0
20	6218-7	08/06/86	TYNDALL	14:33:50.23	15:02:57.95	F-16	GRIF	.0	.0
21	6218-7	08/06/86	TYNDALL	14:33:50.23	15:02:57.95	F-16	WHAM	6.0	3.0
22	6218-7	08/06/86	TYNDALL	14:33:50.23	15:02:57.95	F-16	WHAM	.0	.0
23	6219-3	08/07/86	TYNDALL	10:01:18.55	10:20:36.15	F-16	INDE	11.0	.0
24	6219-3	08/07/86	TYNDALL	10:01:18.55	10:20:36.15	F-15	INDE	15.0	.0
25	6223-1	08/11/86	TYNDALL	07:55:07.37	08:26:15.87	F-16	TANK	125.0	12.0
26	6223-1	08/11/86	TYNDALL	07:55:07.37	08:26:15.87	F-16	TANK	118.0	4.0
27	6223-1	08/11/86	TYNDALL	07:55:07.37	08:26:15.87	F-16	KAPA	101.0	39.0
28	6223-1	08/11/86	TYNDALL	07:55:07.37	08:26:15.87	F-16	KARA	79.0	49.0
							TOTAL:	630.0	112.0

NUMBER OF SUPERSONIC SORTIES(FLIGHTS): 14
NUMBER OF BOOM PRODUCING SORTIES(FLIGHTS): 6

Table B-2. Page 2 of BOOM-MAP Output.

```
TITLE: TYNDALL MOA - ALL MISSIONS AS OF 9/03/85

X-COORD                LOWER BOUND CELL 2 = -132000.0   CELL SIZE = 5280.000
  0   0   0   0   0   0   0   0   0   0   0   4   0   0   0   3   1   3   0   0
  0   0   0   0   0   2   4   4   9  10  10  11  13  15  12   8   3   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0

Y-COORD                LOWER BOUND CELL 2 = -132000.0   CELL SIZE = 5280.000
  0   0   0   0   0   0   0   0   0   2   1   0   0   0   1   1   0   0   0   1
  7   3  14  12   9  12  14  13  10   7   5   0   0   0   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0

Z-COORD                LOWER BOUND CELL 2 =        .0   CELL SIZE = 1000.000
  3   0   0   0   0   0   0   0   0   0   0   0   0   2   0   2   1   0   0   2
  5   6   0   4   2   0   0   0   0   0   0   0   0  36  52   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0

EFFECTIVE HEIGHT       LOWER BOUND CELL 2 =        .0   CELL SIZE = 1000.000   RMS =29473.485
  3   0   0   0   0   0   0   2   1   1   1   1   0   1   8   2   2   0   1   0
  2   1   1   0   0   1   0   1   0   1   1  11  44   6  10   6   1   1   1   1
  1   3   1   0   0   0   1   0   0   0   0   0

MACH NUMBER            LOWER BOUND CELL 2 =       1.0   CELL SIZE =      .020   RMS =    1.191
  0   0   0   2   2  14   5   1  20  28   5   2   1   1   2  14  12   3   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

CUTOFF MACH NO.        LOWER BOUND CELL 2 =       1.0   CELL SIZE =      .020   RMS =    1.130
  0   0   0   3   5  16   0   3  85   0   0   0   0   0   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

EFFECTIVE MACH NO.     LOWER BOUND CELL 2 =       1.0   CELL SIZE =      .020   RMS =    1.255
  0   0   0   0   2   1   3   1   7  24  16   9  13   3   6   9   8   6   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
  0   1   0   0   0   0   0   1   0   0   0   0   0   0   0   0   0   0   1

OVERPRESSURE (PSI)     LOWER BOUND CELL 2 =        .0   CELL SIZE =      .250
  0   0   0  37   1   0   4   3   3   8   0   0   1   1   1   0   0   3   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

PEAK LEVEL             LOWER BOUND CELL 2 =     115.0   CELL SIZE =      .500
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   1   1   1  13  35  32
  3   1   1   0   0   0   0   0   0   0   1   2   1   2   0   1   0   2   6   3
  0   0   0   0   1   1   0   1   0   0   2   1   0   0   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

C-LEVEL                LOWER BOUND CELL 2 =      90.0   CELL SIZE =      .500
  0   0   0   0   0   0   0   0   0   0   0   0   1   1   1  13  35  32   3   1
  1   0   0   0   0   0   0   0   1   2   1   2   0   1   0   2   6   3   0   0
  0   0   1   1   0   1   0   0   2   1   0   0   0   0   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

A-LEVEL                LOWER BOUND CELL 2 =      80.0   CELL SIZE =      .500
  0   1   0   1   0   2   8  11  31  20  12   0   1   1   0   0   0   0   0   0
  0   0   0   0   0   0   1   1   2   0   1   1   0   1   0   1   2   3   4   1
  0   0   0   0   0   1   0   1   0   1   0   0   0   1   2   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

TIME GREATER THAN MACH 1.0 (SEC) =   630    TIME GREATER THAN CUTOFF MACH NO (SEC) =   112
```

Table B-3. Page 3 of BOOM-MAP Output.

X-COORD LOWER BOUND CELL 2 = -132000.0 CELL SIZE = 5280.000

Y-COORD LOWER BOUND CELL 2 = -132000.0 CELL SIZE = 5280.000

52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4
23	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B-4. Page 4 of BOOM-MAP Output.

Y-COORD LOWER BOUND CELL 2 = -132000.0 CELL SIZE = 5280.000

Y-COORD LOWER BOUND CELL 2 = -132000.0 CELL SIZE = 5280.000

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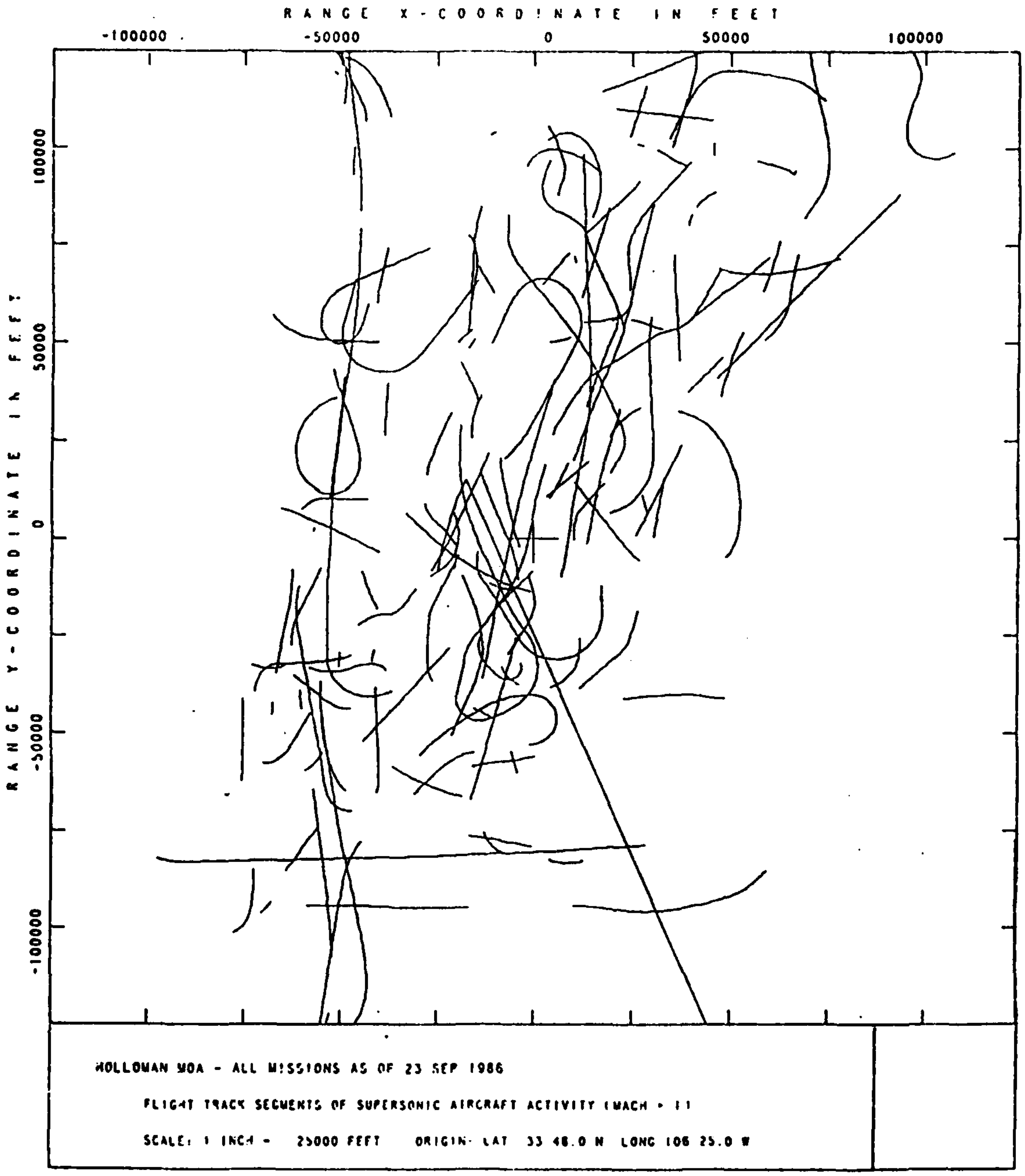
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B-5. Page 5 of BOOM-MAP Output.



RANGE X-COORDINATE IN FEET
-100000
-50000
0
50000
100000
RANGE Y-COORDINATE IN FEET
100000
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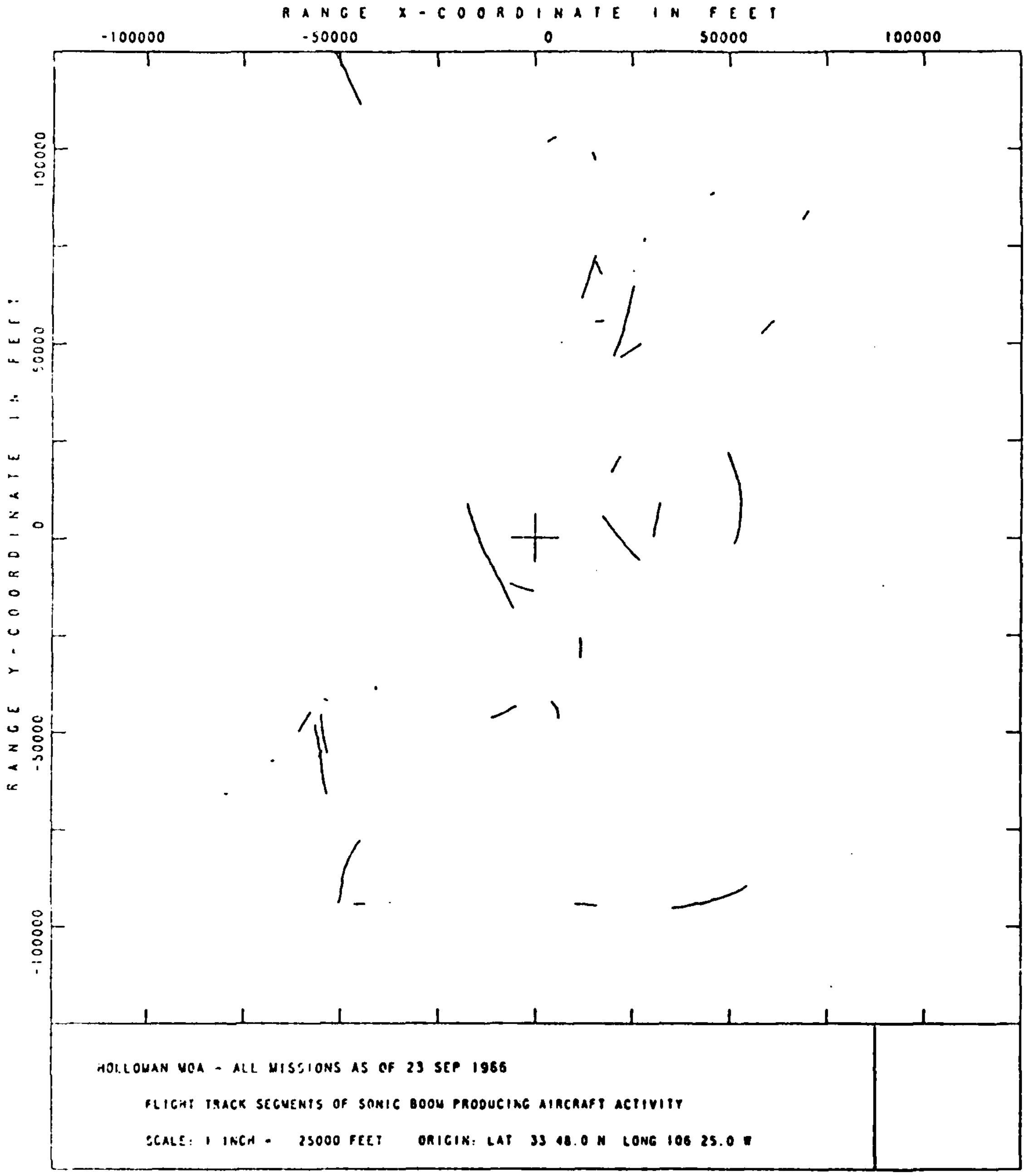
0
-50000
-100000
HOLLOMAN MOA - ALL MISSIONS AS OF 23 SEP 1986
FLIGHT TRACK SEGMENTS OF SUPERSONIC AIRCRAFT ACTIVITY (MACH > 1)
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 33 48.0 N LONG 106 25.0 W

Figure B-1.



RANGE X-COORDINATE IN FEET
-100000
-50000
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50000
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RANGE Y-COORDINATE IN FEET
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50000
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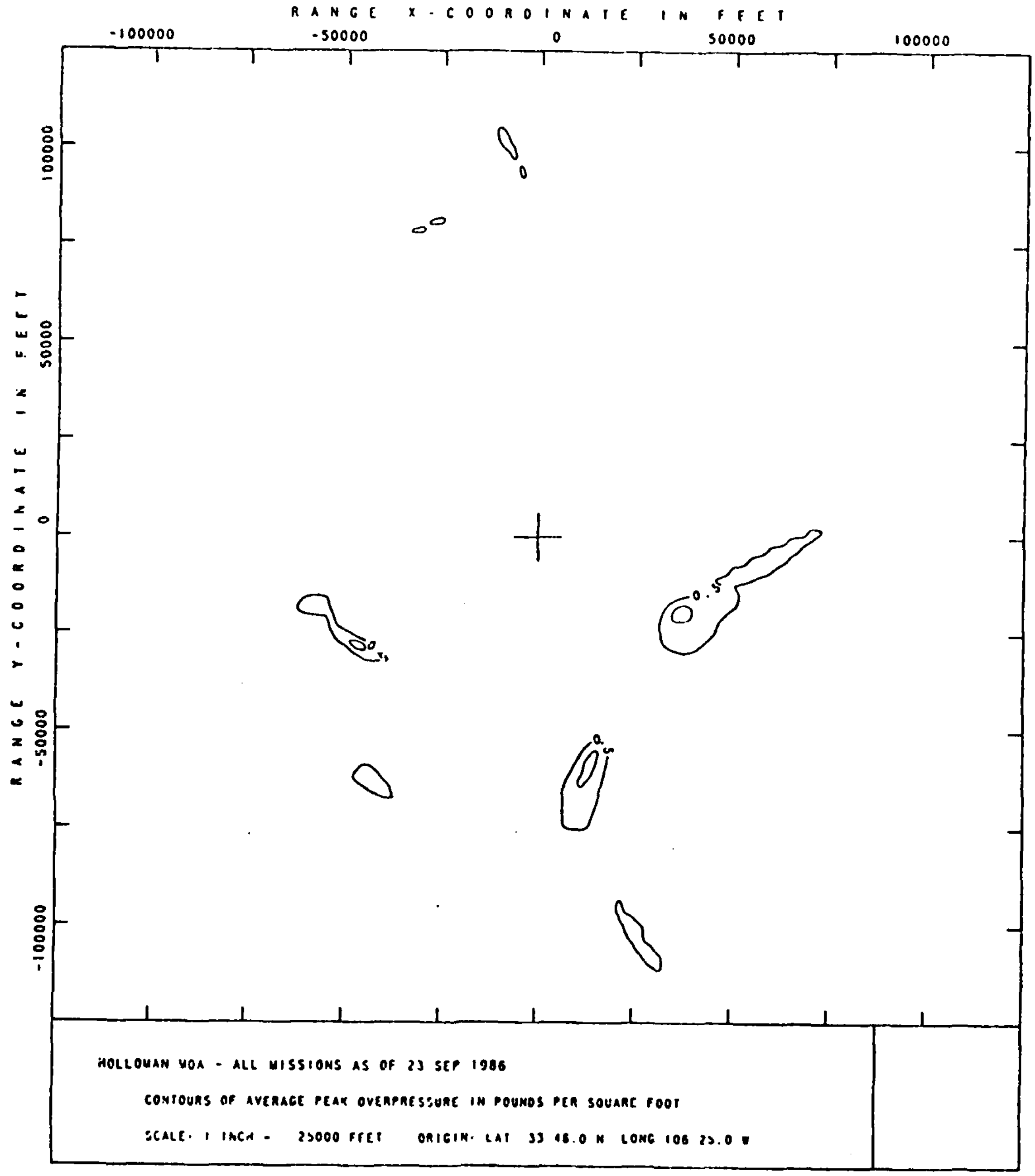
-50000
-100000
HOLLOMAN MOA - ALL MISSIONS AS OF 23 SEP 1966
FLIGHT TRACK SEGMENTS OF SONIC BOOM PRODUCING AIRCRAFT ACTIVITY
SCALE: 1 INCH = 25000 FEET   ORIGIN: LAT 33 48.0 N LONG 106 25.0 W

Figure B-2.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RANGE Y-COORDINATE IN FEET
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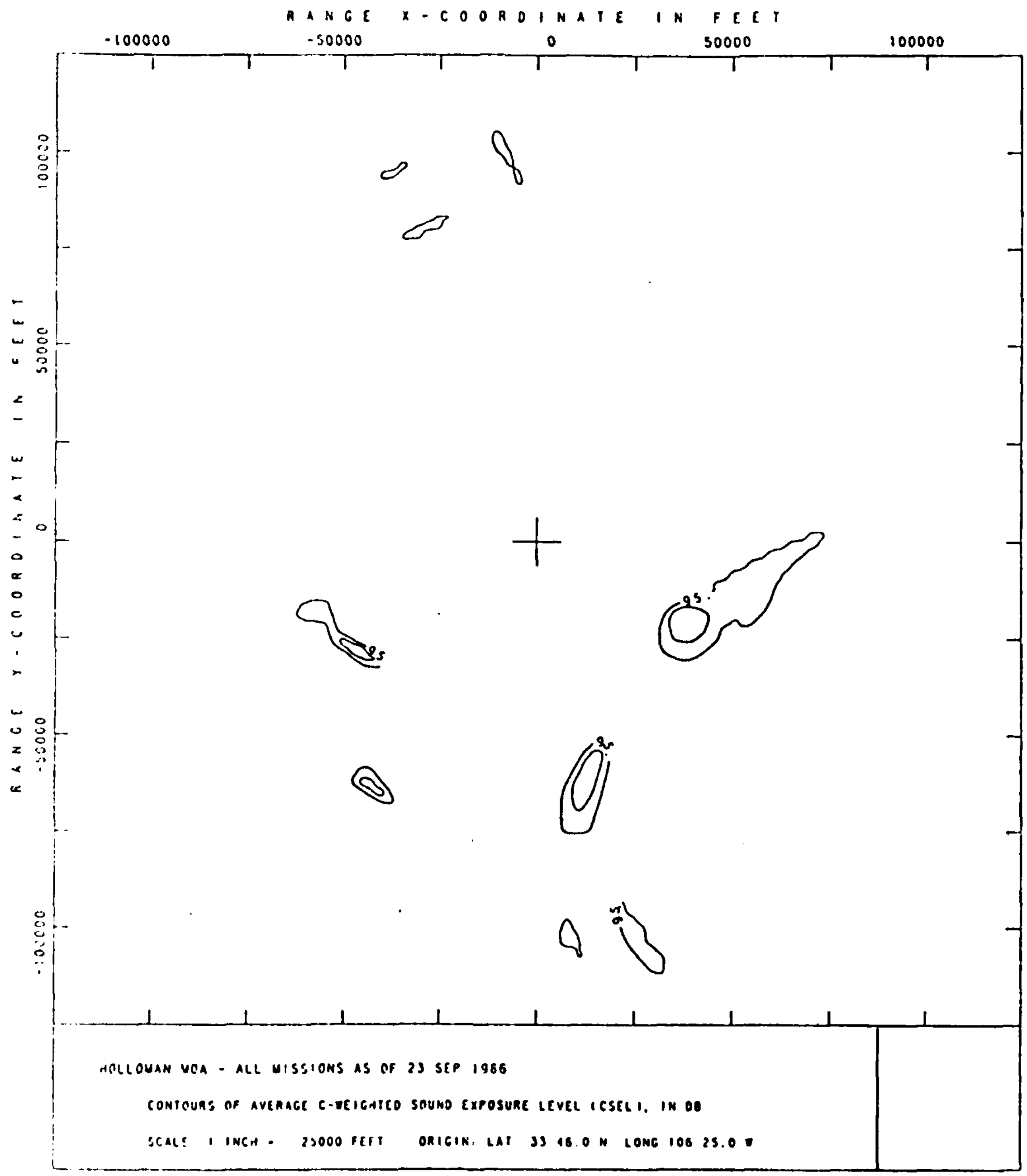
-100000
0.5
HOLLOMAN MOA - ALL MISSIONS AS OF 23 SEP 1986
CONTOURS OF AVERAGE PEAK OVERPRESSURE IN POUNDS PER SQUARE FOOT
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 33 48.0 N LONG 106 25.0 W

Figure B-3.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RANGE Y-COORDINATE IN FEET
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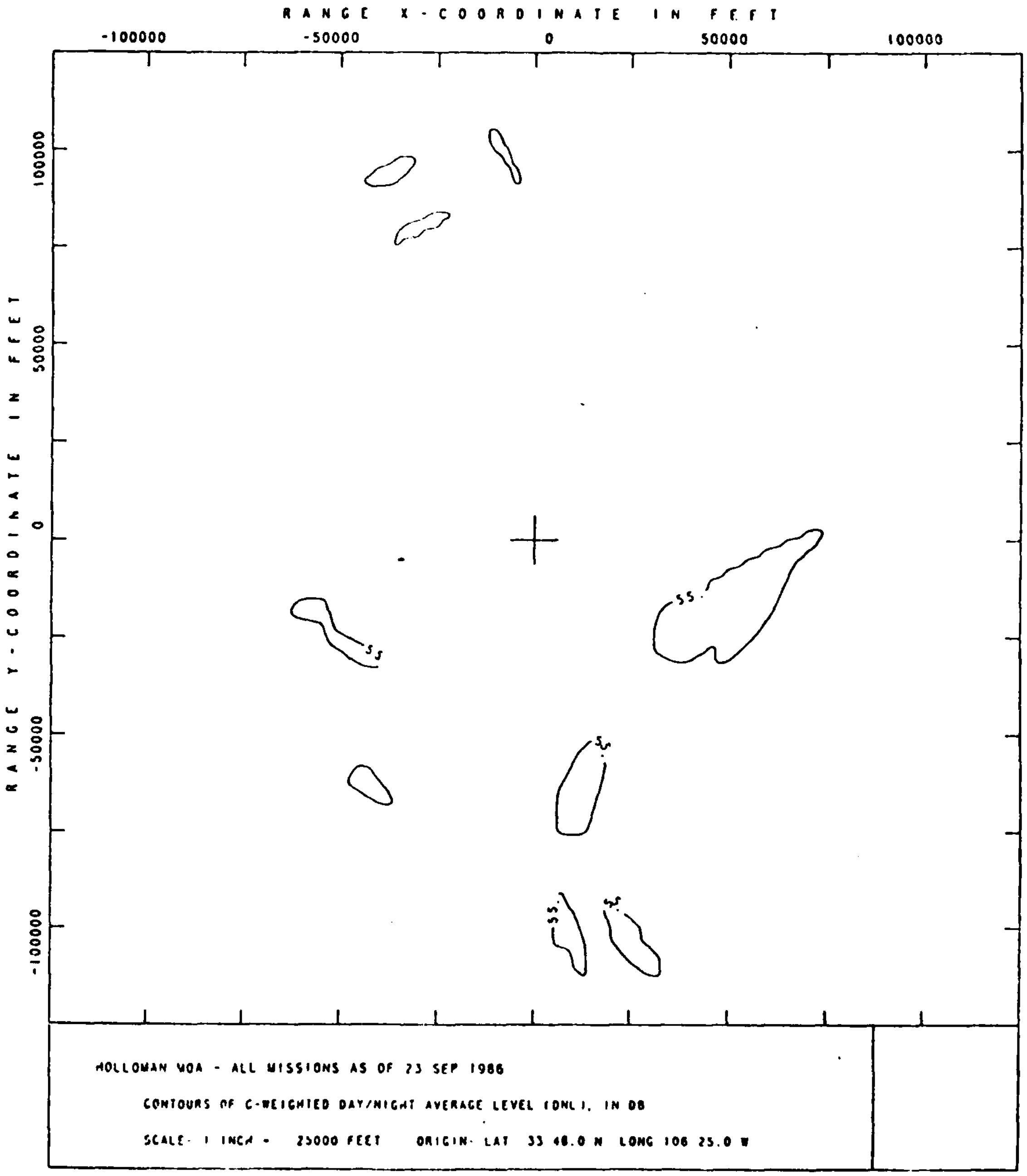
-100000
95
95
95
95
95
HOLLOMAN MOA - ALL MISSIONS AS OF 23 SEP 1986
CONTOURS OF AVERAGE C-WEIGHTED SOUND EXPOSURE LEVEL (CSEL), IN DB
SCALE 1 INCH = 25000 FEET ORIGIN: LAT 33 46.0 N LONG 106 25.0 W

Figure B-4.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RANGE Y-COORDINATE IN FEET
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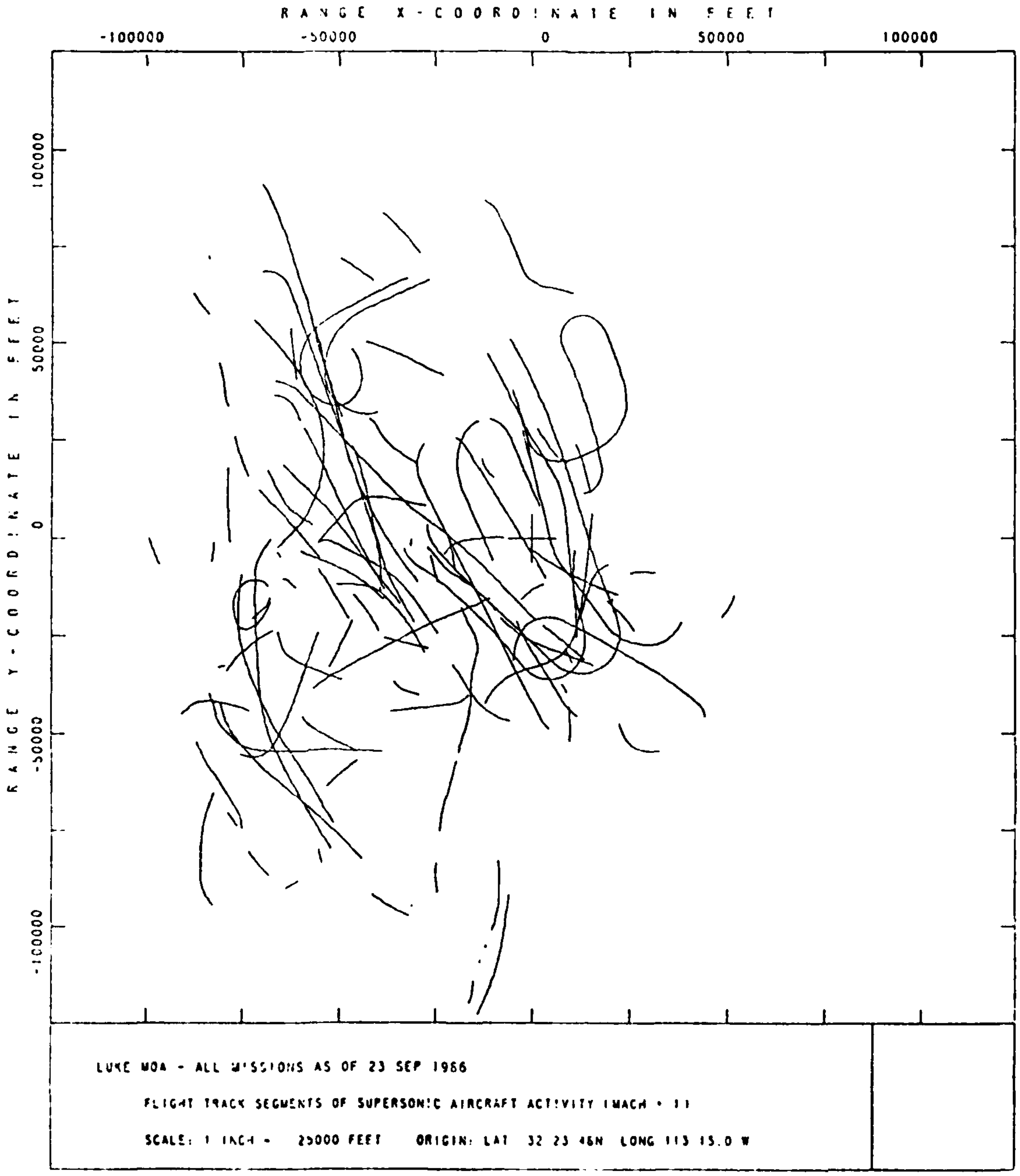
-50000
-100000
55
55
55
55
55
HOLLOMAN MOA - ALL MISSIONS AS OF 23 SEP 1986
CONTOURS OF C-WEIGHTED DAY/NIGHT AVERAGE LEVEL (DNL), IN DB
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 33 48.0 N LONG 106 25.0 W

Figure B-5.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100000
RANGE Y-COORDINATE IN FEET
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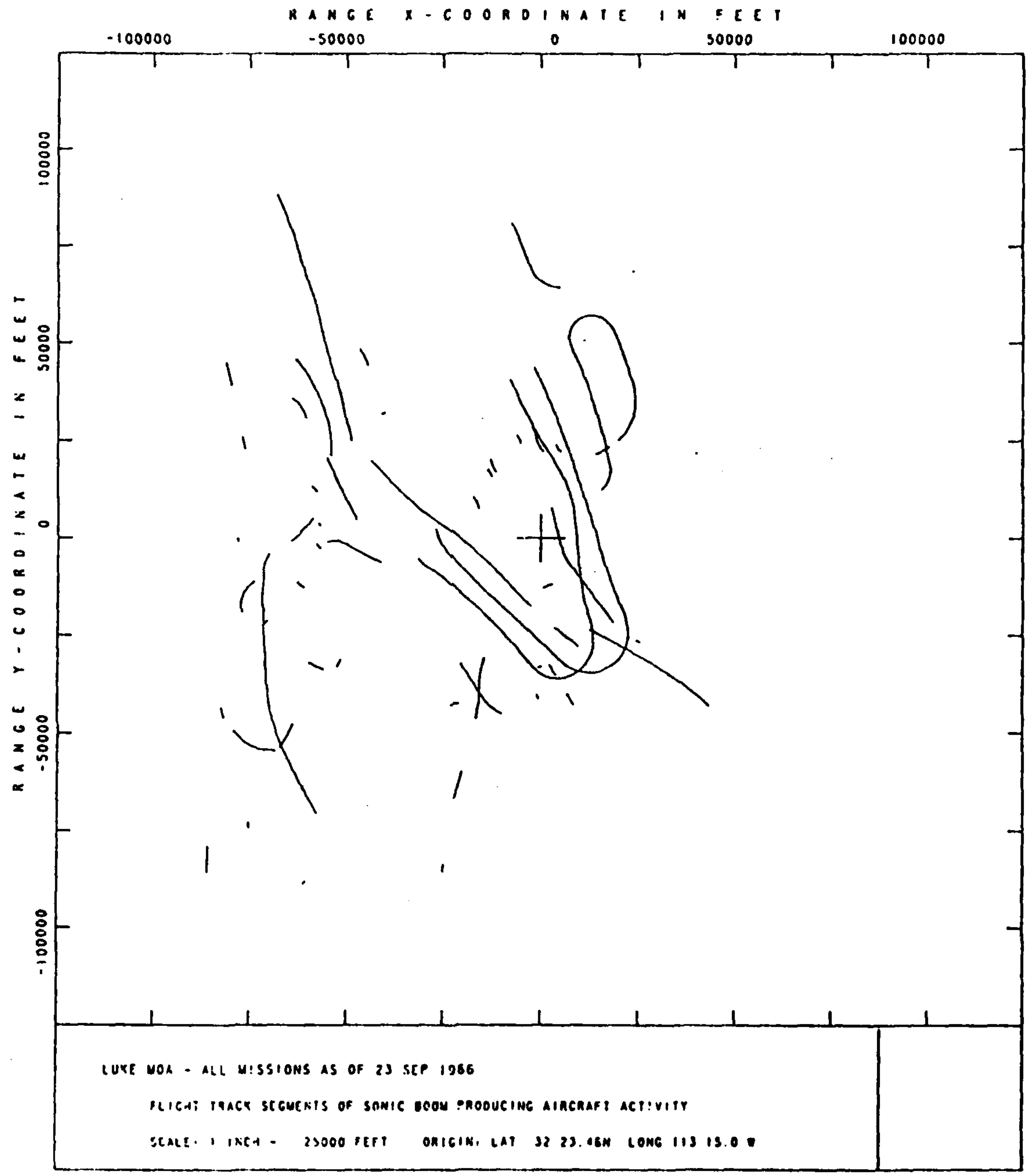
50000
0
-50000
-100000
LUKE MOA - ALL MISSIONS AS OF 23 SEP 1986
FLIGHT TRACK SEGMENTS OF SUPERSONIC AIRCRAFT ACTIVITY (MACH > 1)
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 32 23 46N LONG 113 15.0 W

Figure B-6.



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RANGE Y-COORDINATE IN FEET
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50000
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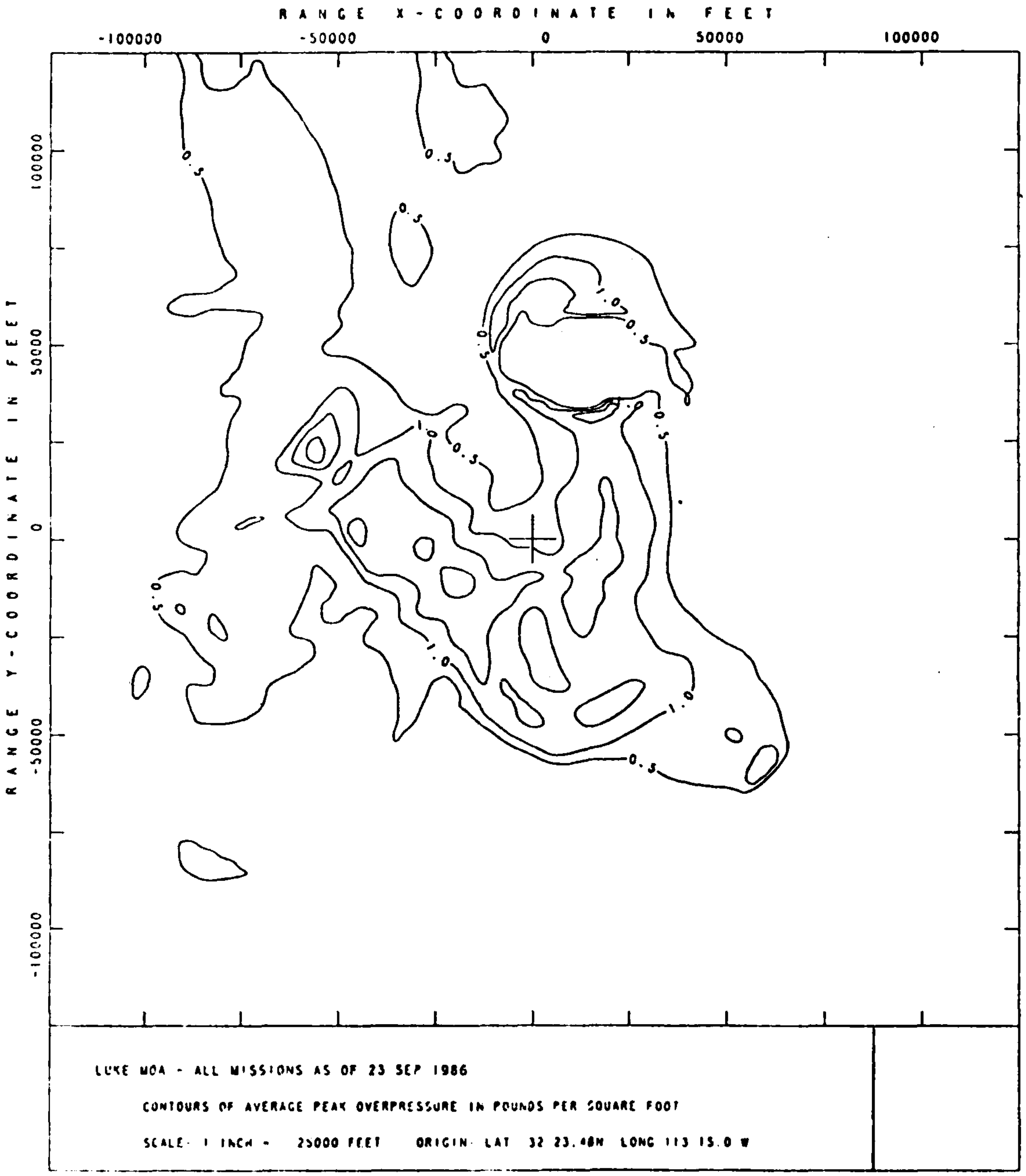
-50000
-100000
LUKE MOA - ALL MISSIONS AS OF 23 SEP 1986
FLIGHT TRACK SEGMENTS OF SONIC BOOM PRODUCING AIRCRAFT ACTIVITY
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 32 23.46N LONG 113 15.0 W

Figure B-7.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100000
RANGE Y-COORDINATE IN FEET
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50000
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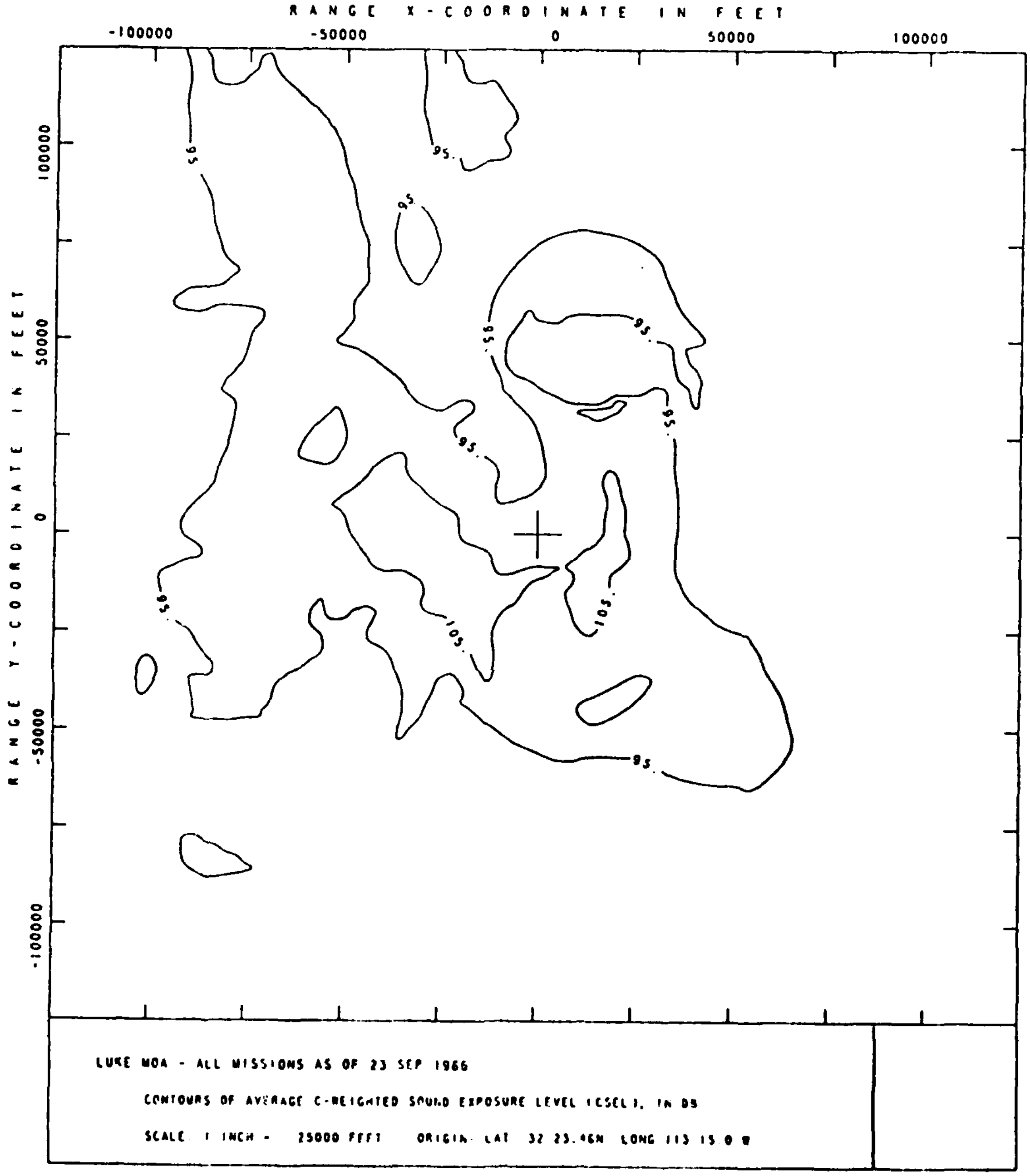
-50000
-100000
0.5
1.0
LUKE MOA - ALL MISSIONS AS OF 23 SEP 1986
CONTOURS OF AVERAGE PEAK OVERPRESSURE IN POUNDS PER SQUARE FOOT
SCALE: 1 INCH = 25000 FEET   ORIGIN: LAT 32 23.48N LONG 113 15.0 W

Figure B-8.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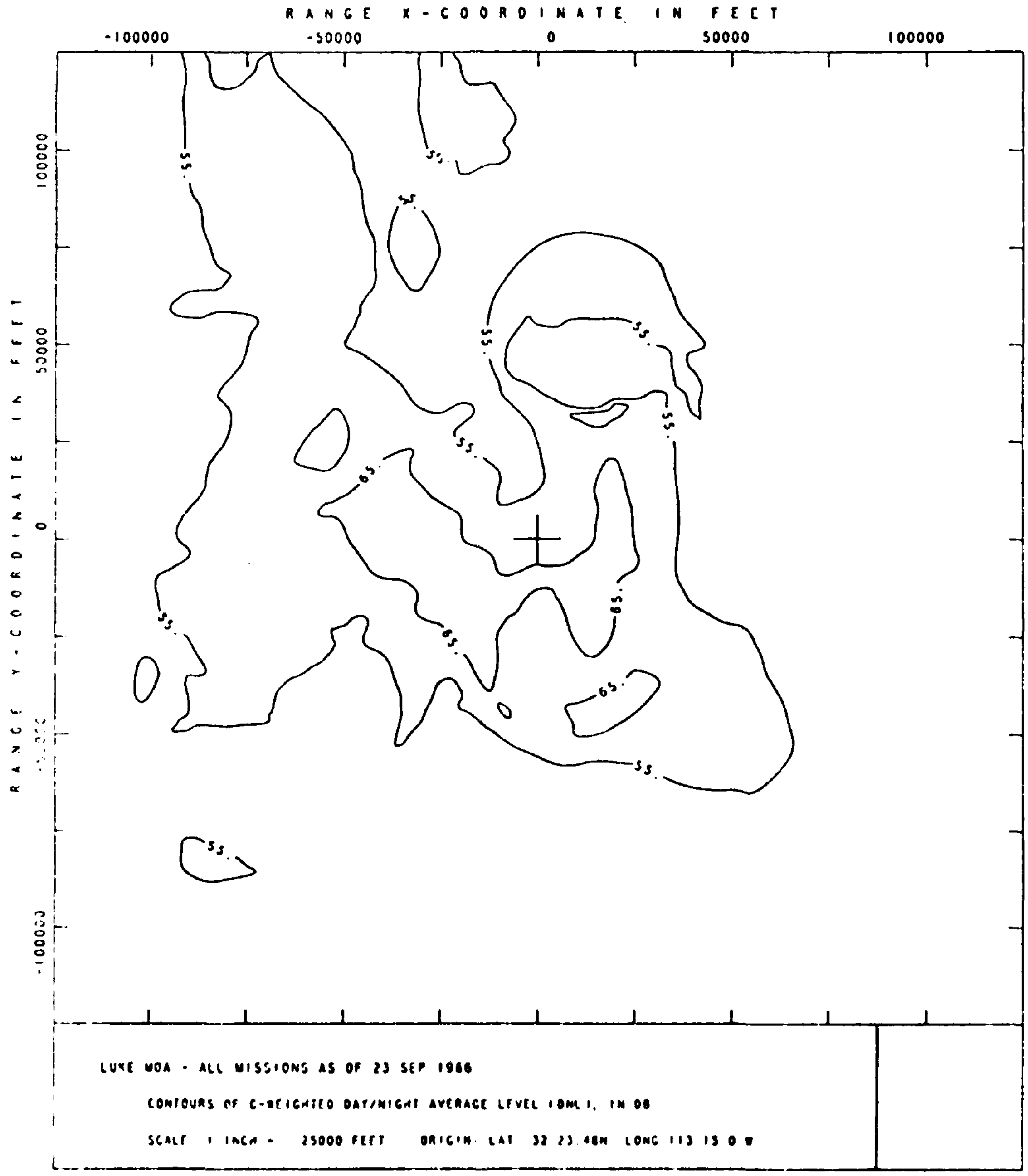
50000
100000
RANGE Y-COORDINATE IN FEET
100000
50000
0
-50000
-100000
95
105
LUKE MOA - ALL MISSIONS AS OF 23 SEP 1986
CONTOURS OF AVERAGE C-WEIGHTED SOUND EXPOSURE LEVEL (CSEL), IN DB
SCALE 1 INCH = 25000 FEET ORIGIN: LAT 32 23.46N LONG 113 15.0 W

Figure B-9.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RANGE Y-COORDINATE IN FEET
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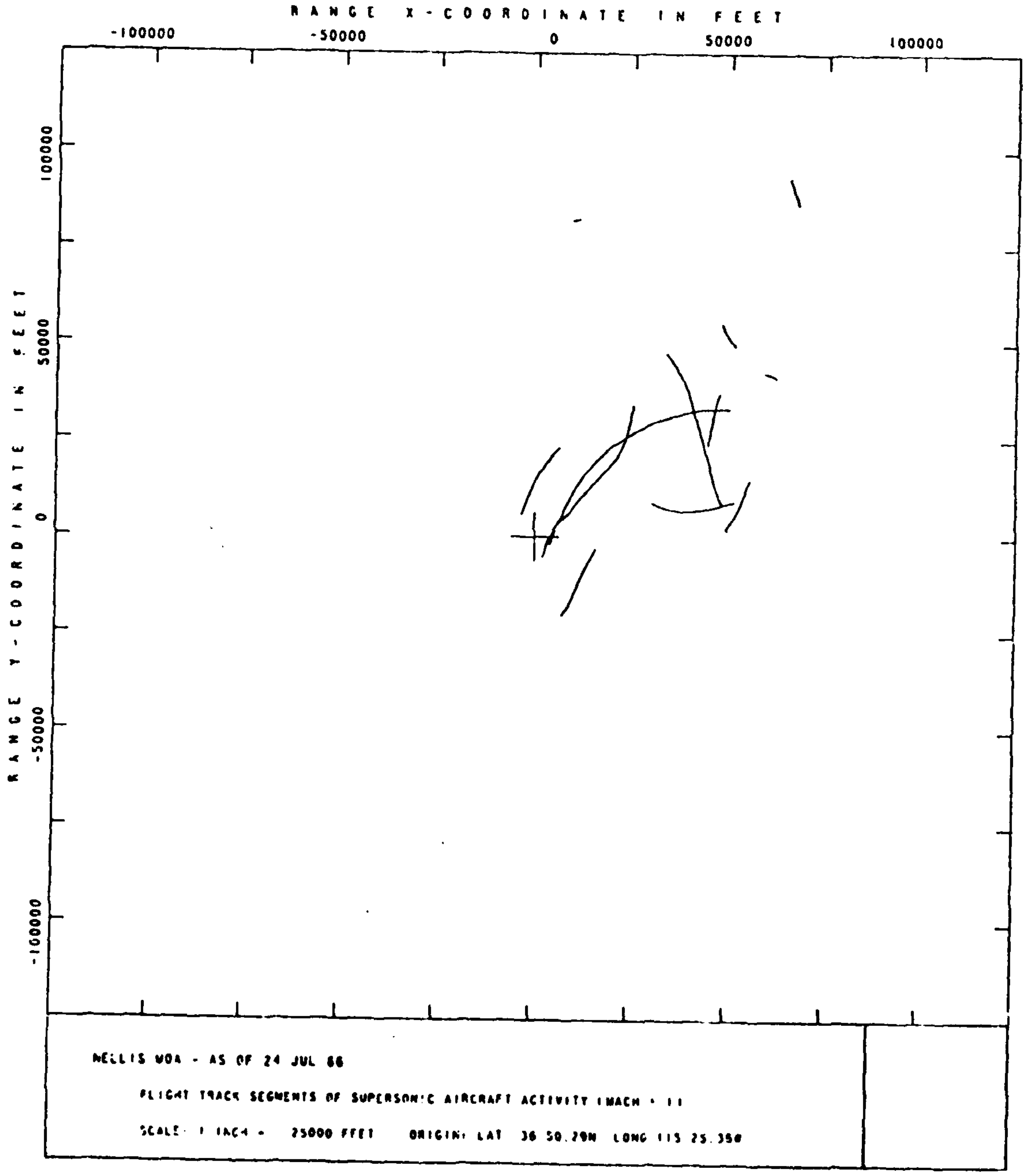
0
-100000
55
65
LUKE MOA - ALL MISSIONS AS OF 23 SEP 1986
CONTOURS OF C-WEIGHTED DAY/NIGHT AVERAGE LEVEL (DNL), IN DB
SCALE 1 INCH = 25000 FEET ORIGIN LAT 32 23.48N LONG 113 15 0 W

Figure B-10.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RANGE Y-COORDINATE IN FEET
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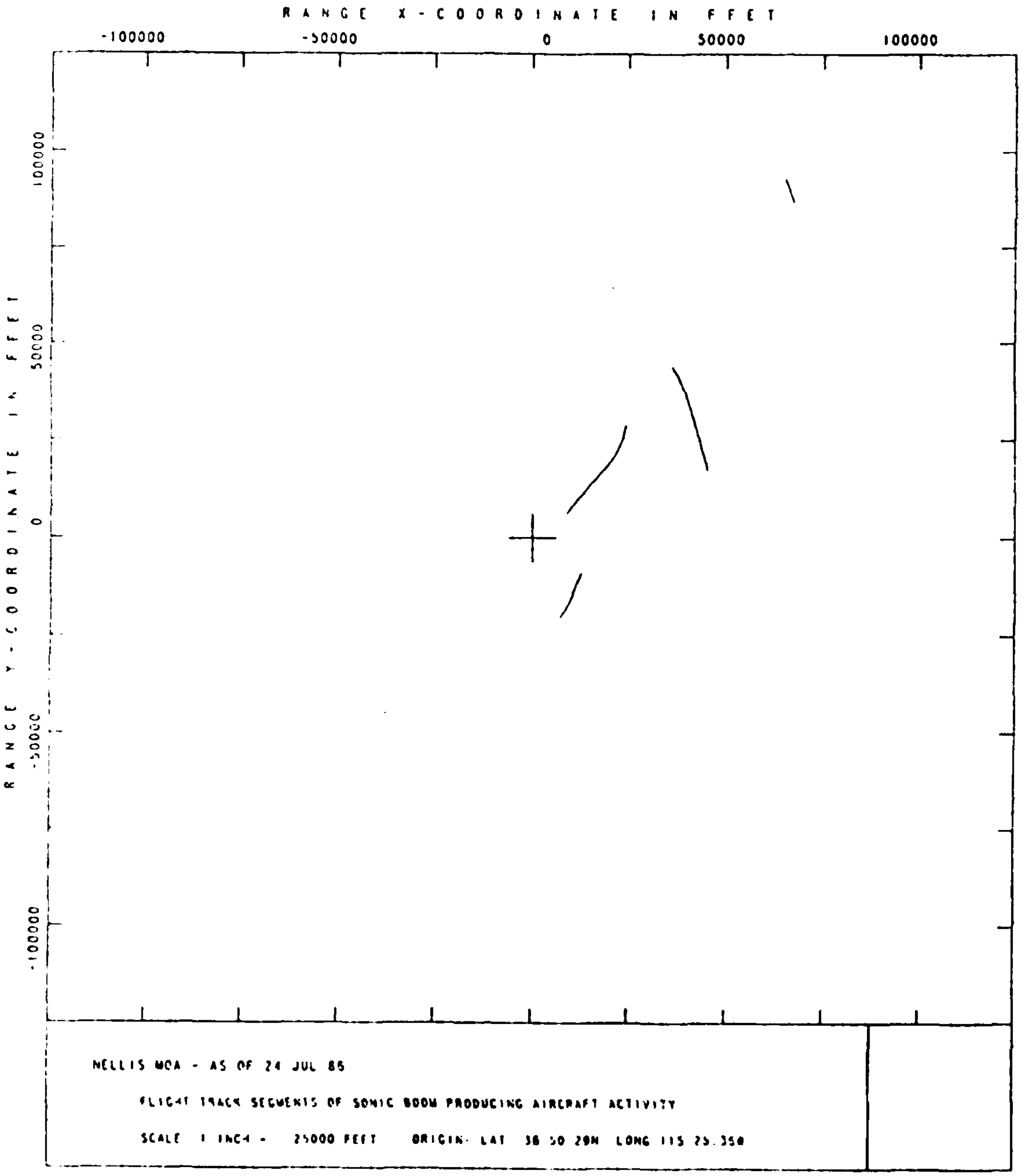
0
-50000
-100000
NELLIS MOA - AS OF 24 JUL 66
FLIGHT TRACK SEGMENTS OF SUPERSONIC AIRCRAFT ACTIVITY (MACH > 1)
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 36 50.29N LONG 115 25.35W

Figure B-11.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RANGE Y-COORDINATE IN FEET
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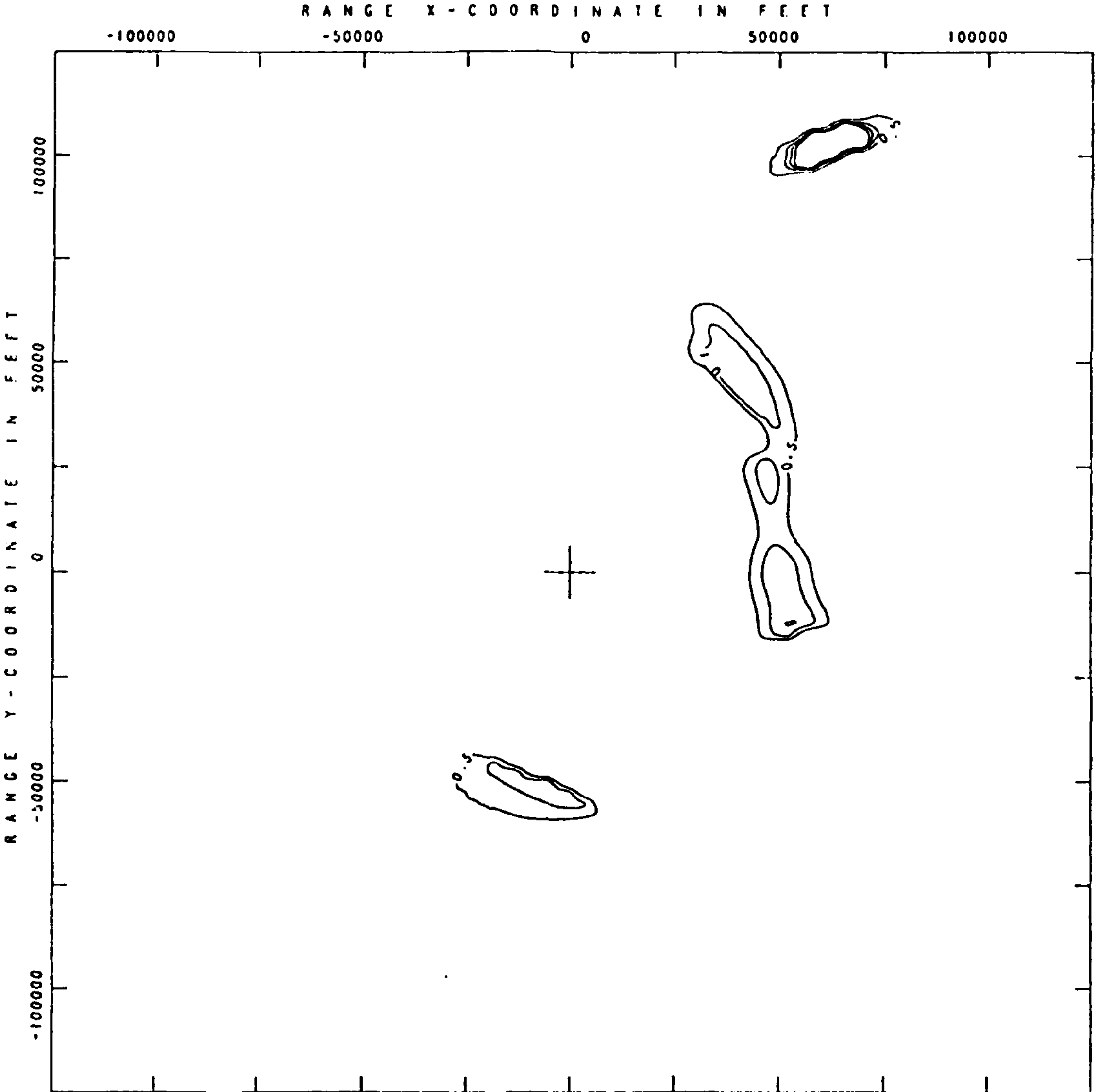
50000
0
-50000
-100000
NELLIS MOA - AS OF 24 JUL 85
FLIGHT TRACK SEGMENTS OF SONIC BOOM PRODUCING AIRCRAFT ACTIVITY
SCALE 1 INCH = 25000 FEET ORIGIN: LAT 36 50 29N LONG 115 25.35W

Figure B-12.

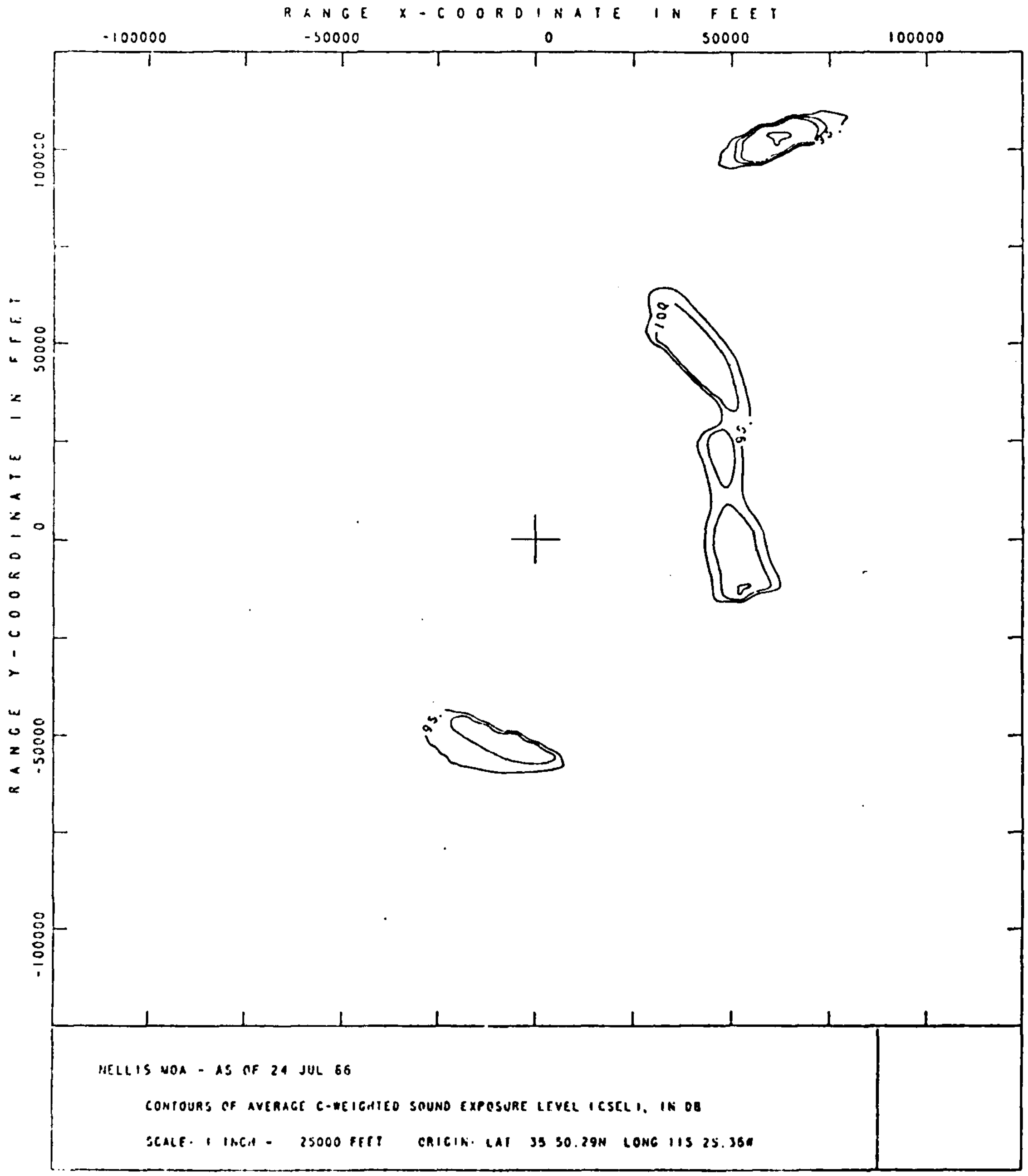


NELLIS MOA - AS OF 24 JUL 86

CONTOURS OF AVERAGE PEAK OVERPRESSURE IN POUNDS PER SQUARE FOOT

SCALE: 1 INCH = 25000 FEET   ORIGIN: LAT 35 50.29N LONG 115 25.35W

Figure B-13.



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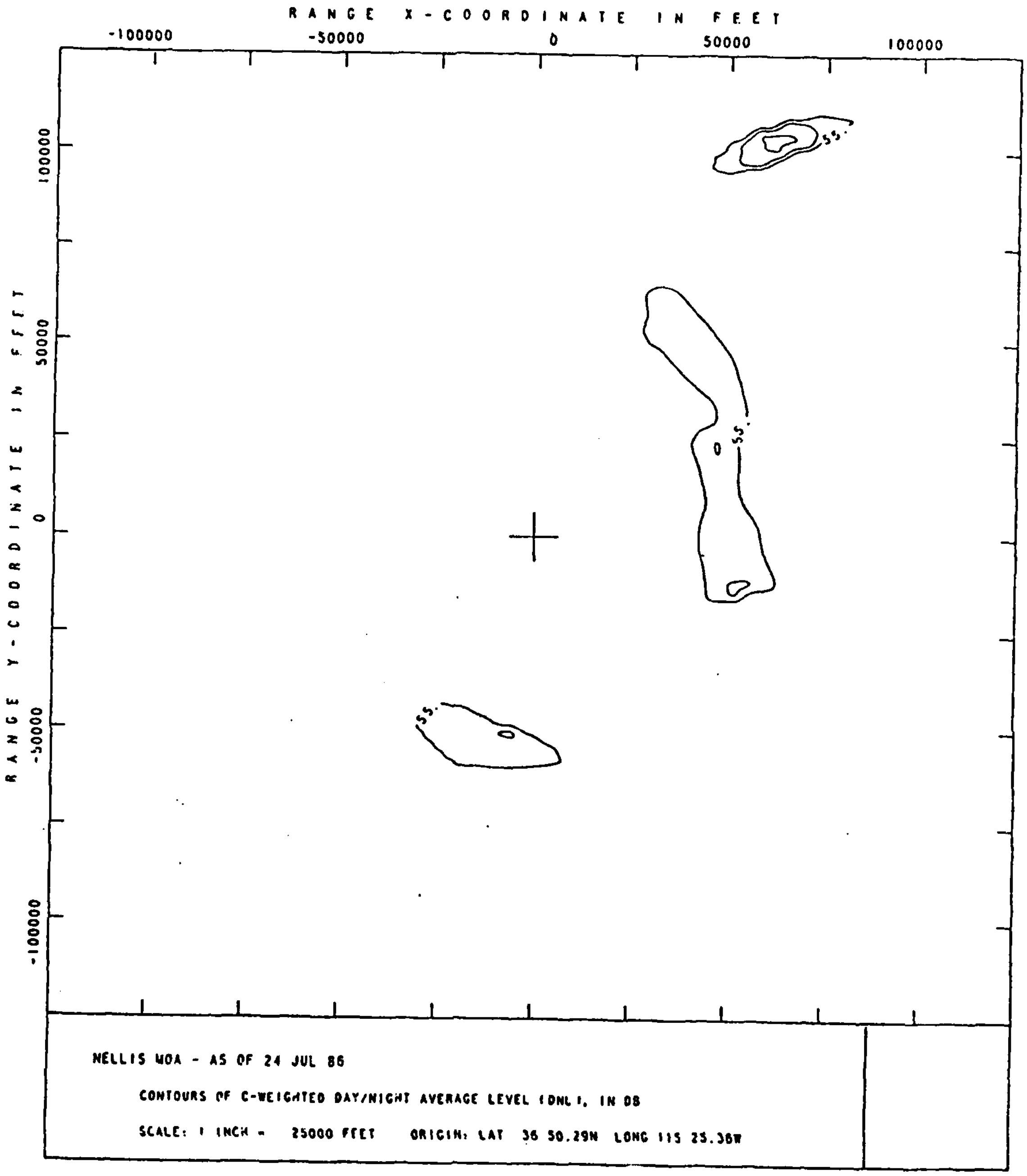
50000
100000
RANGE Y-COORDINATE IN FEET
100000
50000
0
-50000
-100000
100
95
95
95
NELLIS MOA - AS OF 24 JUL 66
CONTOURS OF AVERAGE C-WEIGHTED SOUND EXPOSURE LEVEL (CSEL), IN DB
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 35 50.29N LONG 115 25.36W

Figure B-14.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RANGE Y-COORDINATE IN FEET
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50000
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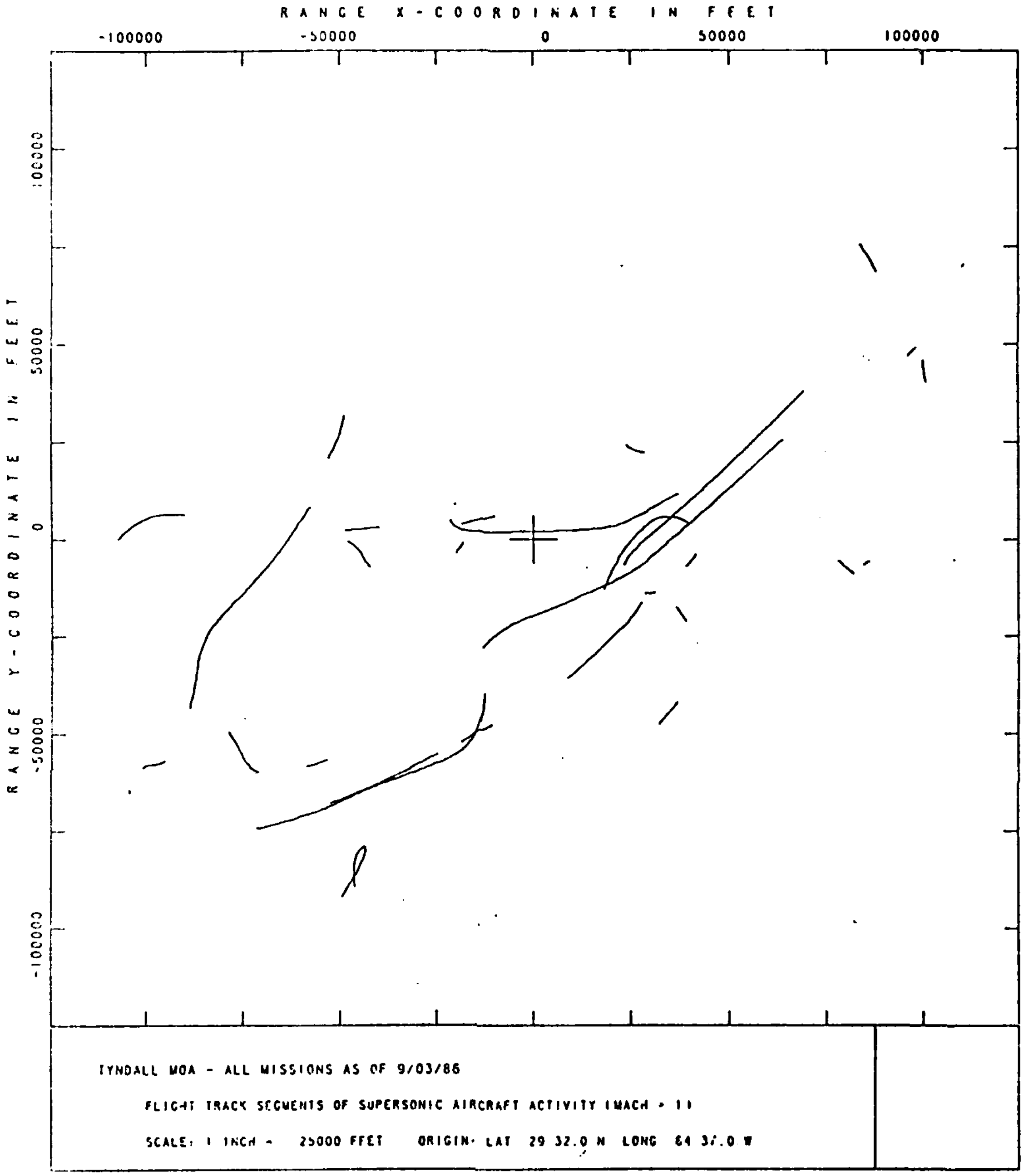
-50000
-100000
55.
55.
55.
NELLIS MOA - AS OF 24 JUL 86
CONTOURS OF C-WEIGHTED DAY/NIGHT AVERAGE LEVEL (DNL), IN DB
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 36 50.29N LONG 115 25.38W

Figure B-15.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RANGE Y-COORDINATE IN FEET
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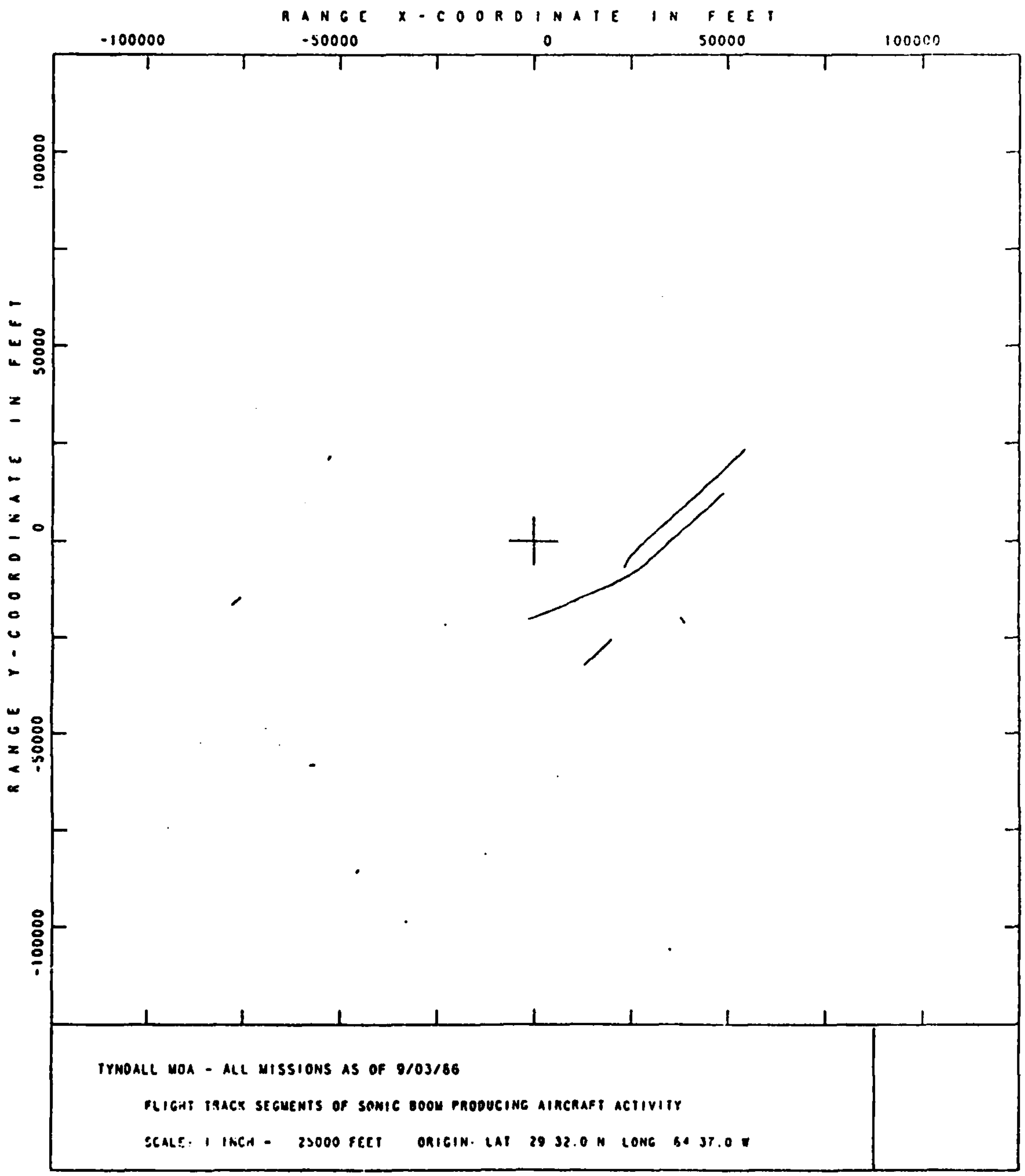
50000
0
-50000
-100000
TYNDALL MOA - ALL MISSIONS AS OF 9/03/86
FLIGHT TRACK SEGMENTS OF SUPERSONIC AIRCRAFT ACTIVITY (MACH > 1)
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 29 32.0 N LONG 84 37.0 W

Figure B-16.


RANGE X-COORDINATE IN FEET
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100000
RANGE Y-COORDINATE IN FEET
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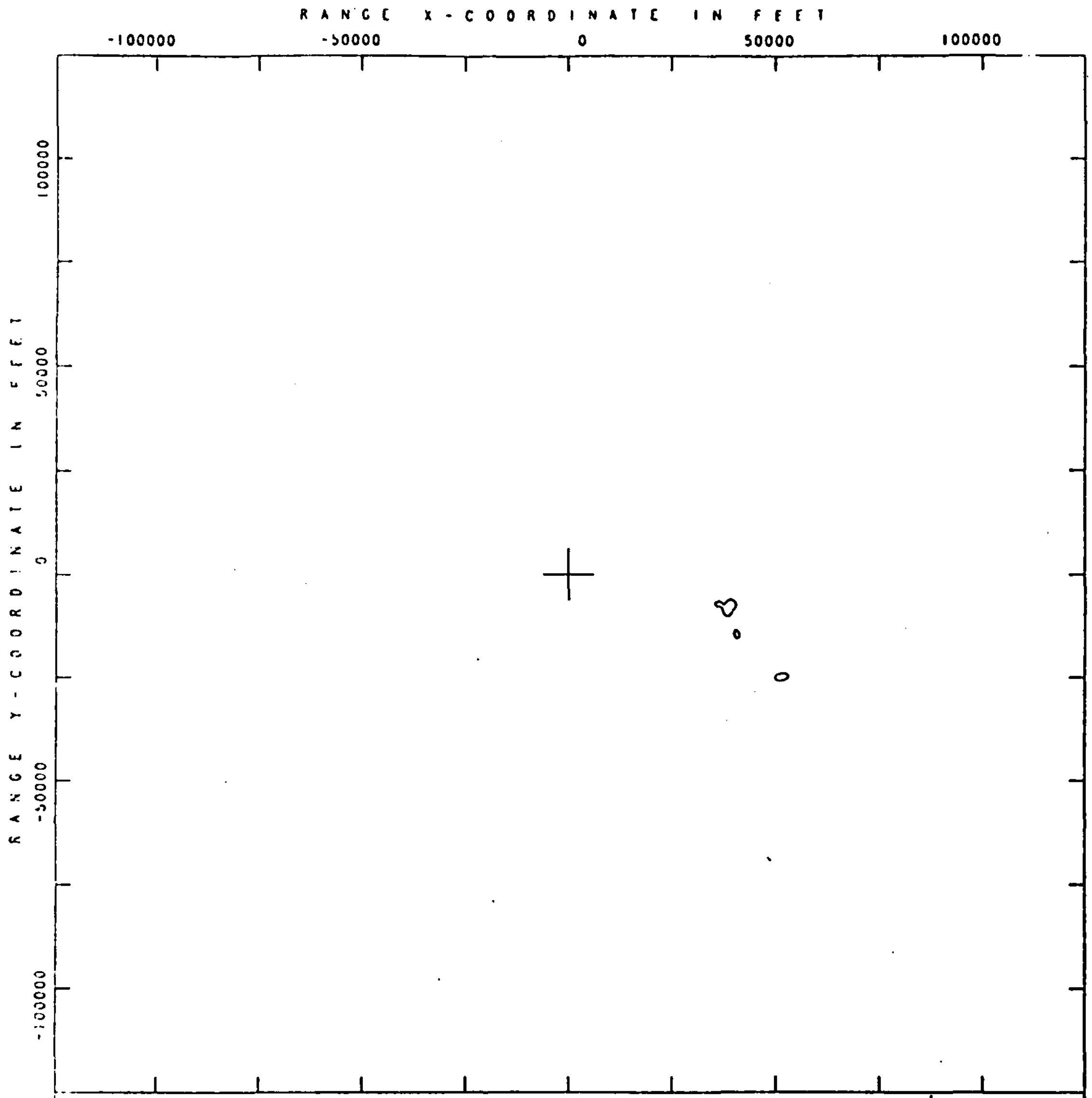
50000
0
-50000
-100000
TYNDALL MOA - ALL MISSIONS AS OF 9/03/86
FLIGHT TRACK SEGMENTS OF SONIC BOOM PRODUCING AIRCRAFT ACTIVITY
SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 29 32.0 N LONG 84 37.0 W

Figure B-17.

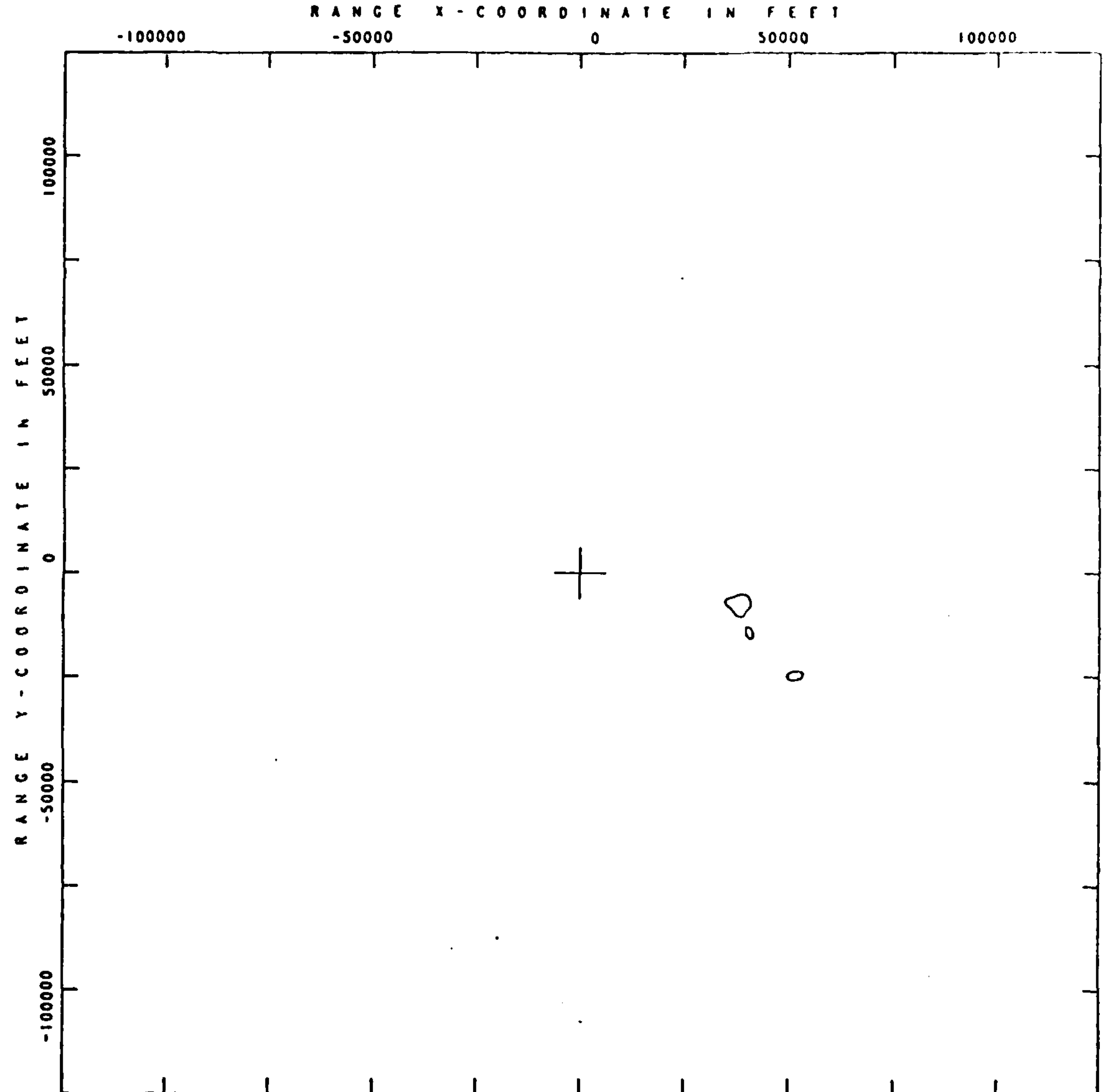


TYNDALL MOA - ALL MISSIONS AS OF 9/03/86

CONTOURS OF AVERAGE PEAK OVERPRESSURE IN POUNDS PER SQUARE FOOT

SCALE: 1 INCH - 25000 FEET   ORIGIN: LAT 29 32.0 N LONG 84 37.0 W

Figure B-18.



TYNDALL MOA - ALL MISSIONS AS OF 9/03/86

CONTOURS OF AVERAGE C-WEIGHTED SOUND EXPOSURE LEVEL (CSEL), IN DB

SCALE: 1 INCH = 25000 FEET ORIGIN: LAT 29 32.0 N LONG 84 37.0 W

Figure B-19.

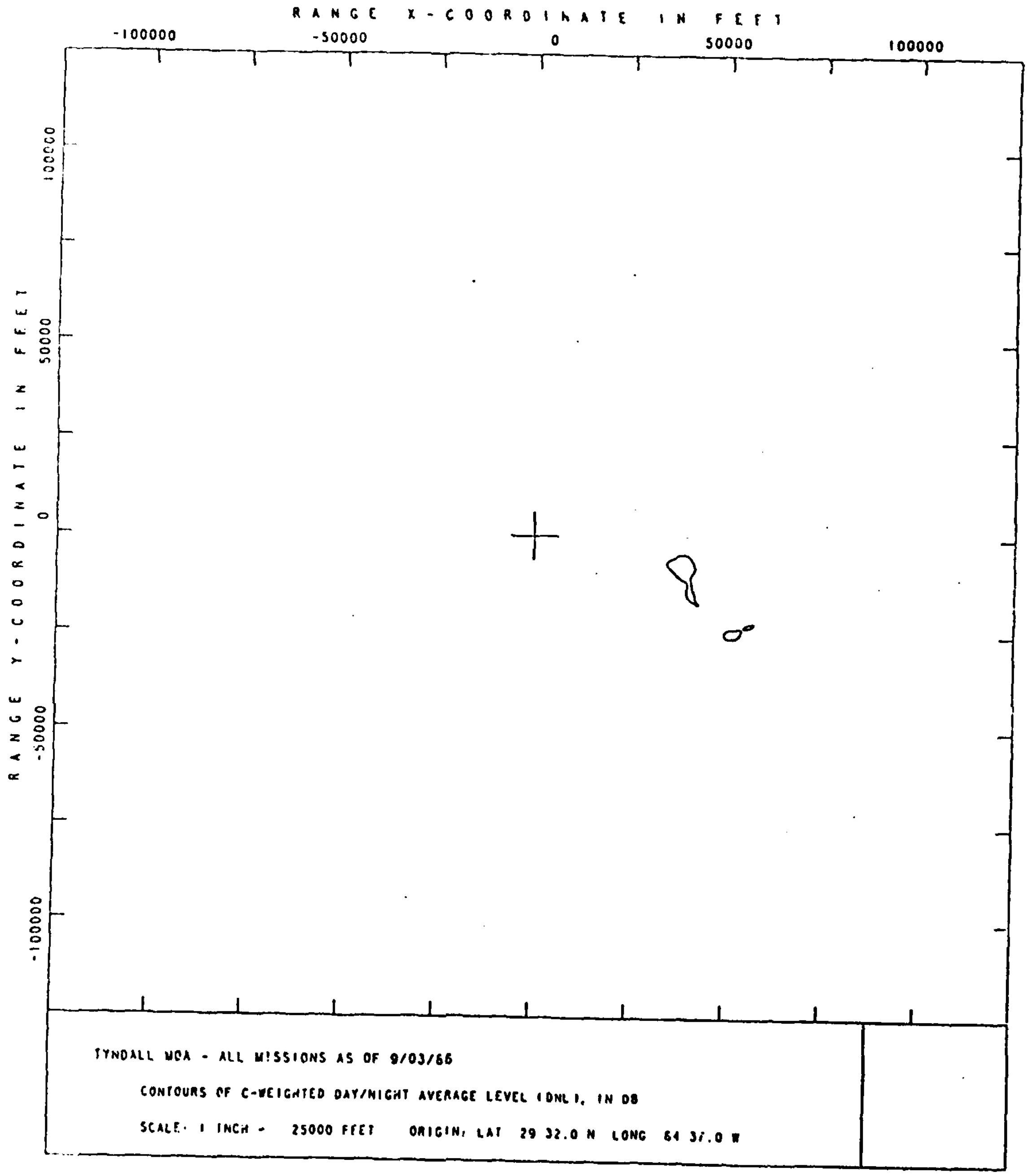


Figure B-20.

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